Summer Service Issue

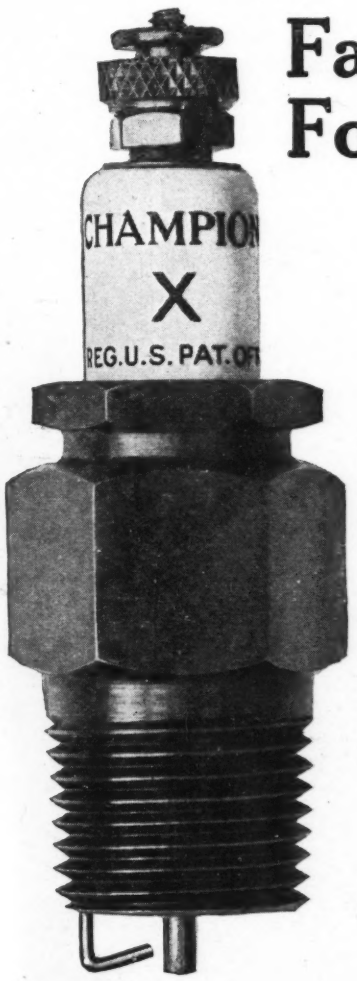
MOTOR AGE

Volume XXXVII
Number 14

PUBLISHED WEEKLY AT THE MALLERS BUILDING
CHICAGO, APRIL 1, 1920

Twenty Cents a Copy
Three Dollars a Year

Champion Dependable Spark Plugs



Factory Equipment on Ford Cars Since 1911

IT is quite unnecessary for Ford owners to risk experimenting with spark plugs.

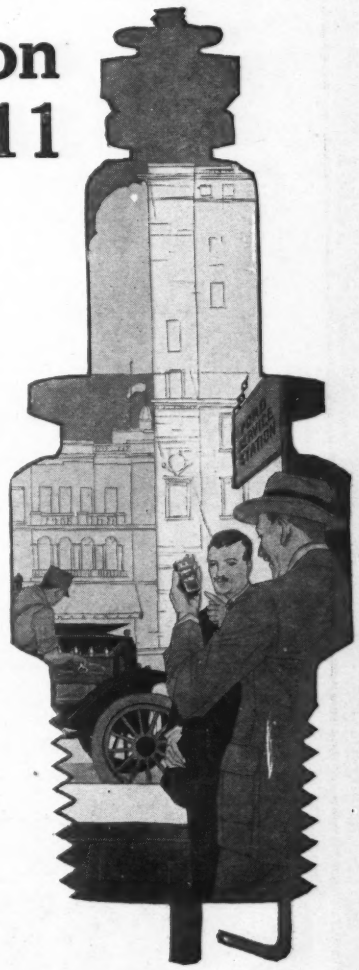
A long time ago, in 1911, the Ford Motor Company chose Champion Spark Plugs as best adapted to the requirements of the Ford car.

The judgment of Ford engineers is summed up in the Ford Motor Company's instruction book as follows:

"There is nothing to be gained by experimenting with different makes of plugs. The make of plugs with which Ford engines are equipped when they leave the factory are best adapted to the requirements of the motor."

Dealers should make sure that their stocks are complete.

Be sure the name Champion is on the Insulator and the World Trade Mark on the Box



Champion Spark Plug Company, Toledo, Ohio

Champion Spark Plug Company, of Canada, Limited, Windsor, Ontario

Entered as second-class matter Sept. 19, 1899, at the post office at Chicago, Ill., under act of March 3, 1879.

JOHNSON'S CARBON REMOVER

In

YOU can keep your motor snappy and full of "pep" by ***preventing*** the accumulation of carbon.

Don't wait until your engine is choked and caked with it. Use Johnson's Carbon Remover every 500 miles, then the carbon is removed while it is soft and powdery, eliminating the frequent grinding of valves and ***keeping*** the motor ***always*** clean. No experience or labor required—you can easily do it yourself in ten minutes—and the cost is trifling.

Easy — Clean — Safe — Quick

Johnson's Carbon Remover is the easiest, cleanest, safest and most satisfactory remedy for carbon. It will save you from $3.00 to $5.00 over any other method without laying up the car. A dose of Johnson's Carbon Remover, the engine laxative, will stop that knock—quiet your motor—save your batteries and reduce your gasoline consumption 12% to 25%.

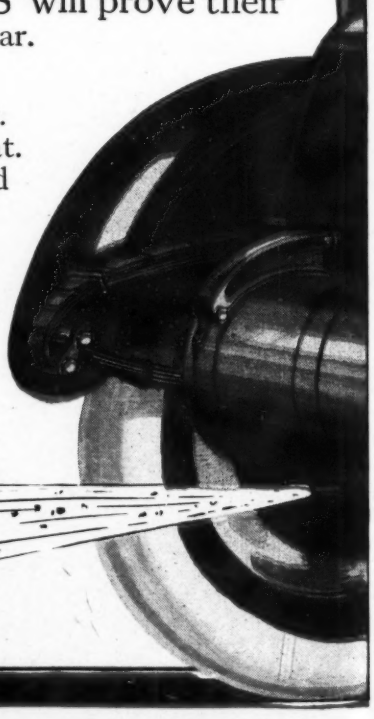
Keep Your Car Young with Johnson's Car Savers

Start today to reduce the depreciation of your automobile. An hour or two every month and JOHNSON'S CAR SAVERS will prove their value in dollars and cents when you come to sell or turn in your car.

Johnson's Radiator Cement—liquid.
Johnson's Stop-Squeak Oil—a wonderful spring lubricant.
Johnson's Valve Grinding Compound—gives a velvet seat.
Johnson's Cleaner and Prepared Wax—make body, hood and fenders look like new.
Johnson's Black-Lac—the perfect top dressing.
Johnson's Auto-Lak—a splendid one coat body varnish.
Johnson's Hastee Patch—can be applied in two minutes.

Write for our folder on "Keeping Cars Young"—it's free.

S. C. JOHNSON & SON Dept. MA 4 Racine, Wis., U. S. A.



Out

MOTOR AGE

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HORACE M. SWETLAND, *Pres.* W. I. RALPH, *Vice-Pres.*
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MOTOR AGE

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"NORMA"

"NORMA"

PRECISION

BALL BEARINGS

(PATENTED)

THE passing of years simply emphasizes the superlative importance of dependable electrical equipment in automotive units. And from year to year the demand increases for "NORMA" equipped magnetos and lighting generators. Which argues an exceptional degree of dependability in this high-grade electrical equipment—to which the exceptional dependability of "NORMA" Bearings unquestionably contributes.

See that your electrical apparatus is "NORMA" equipped.

THE NORMA COMPANY OF AMERICA

Anable Avenue
Long Island City
New York

SERVICE

Ball, Roller, Thrust and Combination Bearings

Some Plugs Make Trouble— HERCULES Makes Profits!

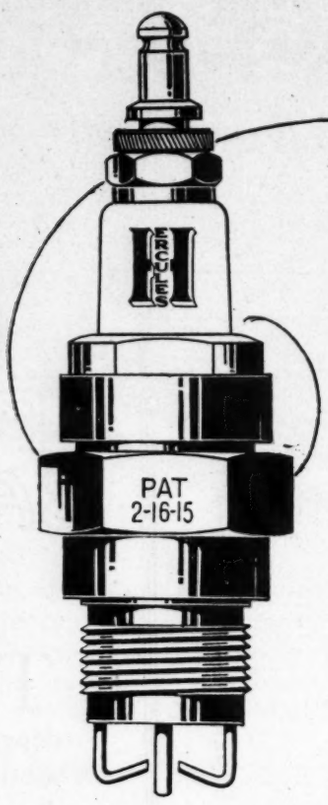
By delivering the best of value in every plug Hercules builds you up more satisfied customers.

Millions of car owners are ready now to—"Equip complete with Hercules."

Seven million readers of leading general and farm publications are learning of them.

Display features for your store and the Hercules Sales Policy keep them moving.

Ask us about them.



The "Flexatite" Assembly Prevents Compression Leakage

The HERCULES is a compression tight spark plug. The stone porcelain insulators eliminate breakage. Millions now in use are proving the better value in efficiency and service. Size charts sent on request. Eclipse Manufacturing Company, Indianapolis, U. S. A.

Ask Your Dealer for

HERCULES
GIANT SPARK PLUGS

This is another of the thirty million Hercules Advertisements that will reach every car owner through the leading weekly and monthly magazines and farm papers during 1920.

Eclipse Mfg. Co., Indianapolis, U. S. A. ***Makers of***

HERCULES
GIANT SPARK PLUGS

The Publisher's Service Station

Rendering Service to Help You Render Service

GETTING STARTED RIGHT

The purpose of this number of MOTOR AGE is to suggest ways and means for going after and getting a bigger and better share of the summer business that is waiting for every progressive merchant.

Between the leaves of this book you are going to find some helpful suggestions that will start you on the right track for this business. With this ammunition and plenty of vigor, vitality, vim and punch ("Pep") behind, you will get your share—and more.

Make It Attractive!

One of your greatest assets is a clean, neat, attractive place of business. You cannot expect to make a good showing in the eyes of your customers unless you do this. If you will read the article "Have You Cleaned House" you will learn how easy it is to make your place really attractive and what it will mean to you from a financial standpoint.

Try a New Method

A progressive dealer doesn't think of doing business in the same old way year after year. New plans and new methods are thought out from time to time as conditions change. There's a story in this number entitled "Ways to Promote Summer Service" that contains seven suggestions, any one of which, if followed out, should produce good results. To be sure, you may have followed some of the ideas suggested but the chances are the remaining ones may give you the nerve to tackle what you thought was the hardest thing. Read them closely.

Don't Overlook Anything

There are some business men, and perhaps there always will be some, who are satisfied to rest content with a certain amount of business. They let their trade forget them. Don't get into this class. Remember that the prestige of the business you have worked so hard to build will turn, perhaps gradually, to a more progressive rival, if you lapse into contentment. Keep your business, your goods, your service ever before the eyes of your customers and look for new sources of business. Isn't there some "Service Work You Don't Get"? Read the article with this title—it may jog your memory a little and call to your mind something you have overlooked.

See the Others

The articles referred to above are but a few of what you'll find in this number. Our editors have tried hard to put some real live suggestions and ideas into them. As we said in the beginning, their object is to suggest ways and means for making the most of what the summer season offers. If you will try to keep in mind that people forget quickly and make it your business to keep them from forgetting your business, your goods and your service, we'll all be a more happy lot.

Announcing
the

NASH FOUR

NASH

THE Nash Four cylinder car is the finished result of years of planning, designing, testing and perfecting. It has the famous Nash Perfected Valve-in-Head motor and is a worthy companion to the Nash Six, being distinguished by the same marked characteristics of beauty, power, comfort and economy. It will be produced at a price made possible by volume production, in a second great Nash factory now building at Milwaukee. It adds further to the recognized value of Nash Dealerships and will be available to buyers late this coming summer.

THE NASH MOTORS CO., KENOSHA, WIS.

NASH MOTORS

VALUE CARS AT VOLUME PRICES

Vol XXXVII, No. 14 CHICAGO, APRIL 1, 1920 $3.00 Per Year

MOTOR AGE

LOOKING OVER THE FIELD

More Than Eight Million Cars, Trucks and Tractors Must Be Serviced and There Are More Vehicles Coming On Every Day

BY B. M. IKERT

NOT until we visualize the field of automotive service, if such is possible, do we begin to see what a herculean task is before us to keep the eight million or more cars, trucks and tractors of this country in running order, to say nothing of the thousands of vehicles daily pouring out of the factories.

With the coming of the summer months the automotive service curve rapidly rises and holds a straight line over a long period. It is for this period that the dealer must prepare. While the passenger car of to-day is an all-year proposition, the fact still remains that more cars are in use in summer than in winter, owing to geographic and other reasons. More trucks are used and it is, of course, the time for tractors. At times the dealer will be heavily loaded with service calls and his

shop will be up to capacity. The manner in which he comes through at these congested periods will depend greatly on how well he is tooled up, not only in machinery, but in all the other departments of service.

Before any problem can intelligently and efficiently be handled there must be the facilities for so doing. So, the first big job of summer service is to make sure you are all set.

The immediate problem confronting the dealers is to get more intensive service from present facilities. It is possible by better accounting methods, better advertising, better policies, labor-saving equipment, education of the men, etc., to get more work done in less time and without adding to the size of the building.

The dealer's service station can be looked upon as a tool—his most important tool, in fact. Like a machine designed to do a certain thing, his building must do certain things. It must be so designed and arranged that it will eliminate, concentrate, do away with waste. It must be built to do one thing—concentrate on service. So, before we can hope to tackle properly the gigantic problem of service we must have the right sort of building. It is unwise to put up a building and then fit it for service. Plan your service and then make the building fit it.

Ready to serve means that the dealer has taken steps toward getting his parts stock in shape. Lack of parts ties up thousands of repair jobs every year and much of the congestion of service stations in summer is due to cars or trucks tied up for want of materials. The dealer can from experience tell the parts most needed and many factories make recommendations along this line. The trick is to see that the parts stock does not run dangerously low.

To avoid a lot of undesirable service work dealers might spend more time with new customers in teaching them to care for their cars. Even the old customers can share in this. It will prevent a large part of the little visits that consume valuable time. Just as much good will is created by sticking with the new customer for awhile and see that he gets off on the right foot. Later on if he needs help he will seek your place because of his confidence in your policies.

WHAT AND WHERE IN THE SUMMER SERVICE ISSUE

Why Not Advertise Service? By Lambert G. Sullivan - - - - - 9

This is a big year to make your service department a paying proposition. Why not let your customers know how you handle this work.

Have You Cleaned House? - - - - - - - - - - 10

Make your building inviting,—a broom, a mop, some paint and some varnish will pay big dividends.

By Their Buildings You Shall Know Them - - - - - - - - 12

Some representative service stations noted for the excellence of their appearance.

Seven Ways to Promote Summer Service. By B. M. Ikert - - - - - 14

Better buildings, better equipment, systematizing service, helping your employes, better parts business, instructing customers and adding departments will aid in accomplishing this end.

Service Work You Don't Get - - - - - - - - - - 18

How you can sell your customers on the idea that you know more about repairs than he does.

Getting Your Men Together - - - - - - - - - - 19

Co-operation never hurt any business,—and it will probably help yours.

What About Parts? - - - - - - - - - - - 20

A well arranged stock room will pay you profits in saving time.

Tooling Up for the Spring Drive. By Roy E. Berg - - - - - - 21

Overhaul the old machinery and install some new if you hope to take full advantage of your opportunities.

And Now Your Parlor. By Tom Wilder - - - - - - - - 26

Tom Wilder shows that the artistic idea is not necessarily incompatible with business, and shows how it can be made to bring new customers and retain old ones.

Keeping the Tractor Fit. By Fred M. Loomis - - - - - - - 37

Service on the tractor means as much to you as selling it, for it should keep your customers sold on you.

Why Not Advertise Service?

This Year is Your Opportunity to Build Up This Department of Your Business

BY LAMBERT G. SULLIVAN

IT is going to be a great deal more interesting to Mr. Motorist this year to know how and where he can get his old car put into the best condition for the summer's use than where he can buy a new car. For Mr. Motorist, if he is in the market for a new car, has by this time just about made up his mind that "there ain't no such animal" as a new car. He has learned from dealers before this that he will have to wait two or three months before he can get a car and may consider himself extremely fortunate if he gets one then.

"I'm going to be afraid to run much automobile news this year except along the lines of touring information," remarked a friend of mine, the Automobile Editor of a big daily newspaper, the other day. "There's no use of running a lot of news about cars when you know that your readers couldn't buy them even if they wished. So about the only stuff I can use this year is going to be for the benefit of the fellows who already have cars."

Those remarks summed up what is the most wonderful opportunity that has even been presented to the Service man to put his business on the most solid foundation that it has ever enjoyed. For even before Mr. Motorist is interested in touring information, he is going to be interested in learning where and how he can put the old bus into condition to enjoy that information.

Right now is the time when the greatest amount of good can be accomplished along service publicity lines. We all know the old car seems all right all winter long, but the first bright spring day brings out troubles which the owner never dreamt existed. The old bus seems mighty shabby and dirty compared with the shining cars making their first appearance; the driver discovers knocks in the engine and rattles which he probably never noticed all through the winter. In a word, he is ripe for a lot of service work and if you have shaped your advertising and your publicity along service lines, you are going to get the cream of the trade.

Undoubtedly the advertising situation at the present time is unique in the United States. Never before has so much money been spent on advertising. Nearly every publication of note has ben obliged, not to take measures to increase its advertising but to regulate the advertising which flows into it. And this tremendous volume of advertising is coming just at a time when publishers are confronted with a difficulty in obtaining a supply of print paper.

And is only natural when there is a tremendous volume of advertising coming from men who have never before advertised, a lot of this good ammunition is going to waste. Business organizations are advertising and creating a demand for their product when they are unable to supply the demands already made upon them. In other words, they are advertising something that they haven't got. This is all very well for the big manufacturers who are doing this merely as a means of creating good will or to put their product before the public at an extremely propitious time.

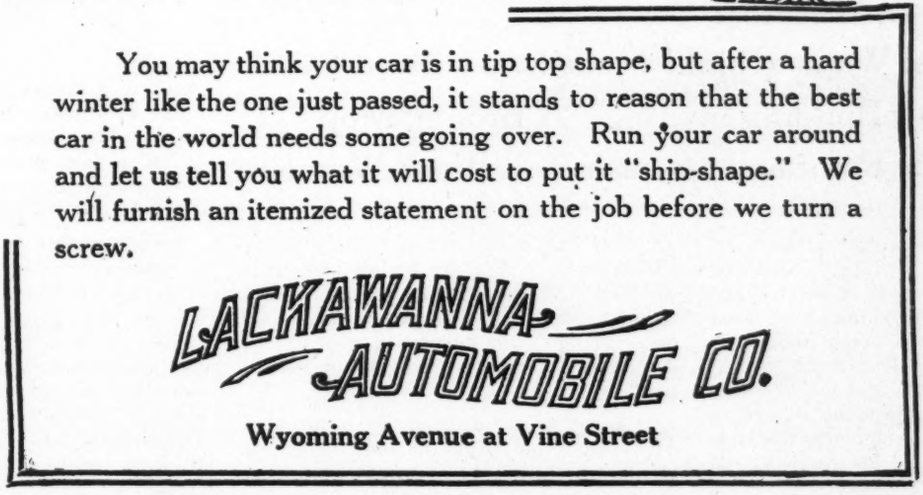
But for the average motor car dealer, it is foolish to keep on advertising cars when he hasn't got them to sell and knows he can't get them. It is even worse than a waste of money, for the man who reads one of those ads and then has the dealer tell him that he can't supply what he advertises, hasn't any particular friendly feeling toward that dealer.

But there is always one thing the dealer has for sale, — an article he can't sell too much of. That article is Service. And this year, 1920, is the time for him to get this article before his public.

Scores of dealers last year found their profits seriously diminished because they sold nearly all the cars they had to sell in the first six or eight months of the year. Up to June or August they looked for a record breaking year,—the biggest profits they ever had had. But from June or August to the end of the year they found that so far from adding to the profits of the first part of the year, they actually had to draw on those profits to meet their running expenses.

But if they will build up their service work this year, they ought not to let that experience occur again. Service work, even for the biggest dealer, ought at least to pay the entire overhead expense of his establishment. And for the smaller dealer, service work ought to pay an extremely handsome measure of profit. Th opportunity for service to-day is just what the opportunity for car sales was five years ago,—practically untouched. And the beauty of service is that there is no limit to the production,—you can sell more and better service without having to rely upon any outside source of supply.

Advertising that service should be the big drive of the dealer this year. Some of the most progressive dealers throughout the United States have already started along these lines. The ad shown on this page brought this dealer wonderful results.


Just a Thought or Two Now Will Save You Worry Later On In the Season
Think
You may think your car is in tip top shape, but after a hard winter like the one just passed, it stands to reason that the best car in the world needs some going over. Run your car around and let us tell you what it will cost to put it "ship-shape." We will furnish an itemized statement on the job before we turn a screw.
LACKAWANNA AUTOMOBILE CO.
Wyoming Avenue at Vine Street

Here is the way a dealer in Scranton, Pa., is using his advertising to bring a demand for what he really has to sell.—Service

One of the Best Ways to Hold Trade Is to Make Your Building Inviting—A Broom, Mop, Some Paint and Varnish Will Work Wonders

BEFORE you can do anything you must get ready to do it. So, before you can expect to get the best in service and really make it the big thing it is, your place of business first must be put in order. It does not matter a great deal whether or not you run a large or small service station, the same ideas regarding cleanliness and more efficient methods applies to both.

The public's idea of efficiency is measured to a great extent by exterior appearance, because it is a pretty safe proposition that where you find a neat-looking service station you will find good shop methods, good system and good all-around work. Occasionally you will find a good mechanic buried in an unkempt service station, but this is an exception to the rule. Good men will not tolerate poor methods of a dirty shop.

Good Looking Exterior

You may not have as pretentious a front yard as that shown in the above illustration, but there are probably a hundred and one things you can do to get results from whatever sort of building layout you have. Sometimes there are altogether too many signs painted all over the front of your building, in which case, it is a good plan to repaint the whole front and then simply dress it up with one real good-looking sign. Too many signs is like getting into a crowd—details are lost and in the jumble nobody reads anything.

A bucket of paint often will work wonders and a lot might be said about replacing broken window lights, or even just washing the windows. A rearrangement of the interior gives the place a new aspect, just like the housewife who decides to put the library table or the piano in a different corner to change the looks of things. It may have the effect that your customers will think you have added to your place, when in reality you have not spent a cent, but merely juggled things around a little.

Perhaps you want to do a little building to make your place roomier

By all means make sure the entrance to your service station looks inviting. A clean exterior is a valuable asset, of course, and a place of business to a large extent is judged by what it looks like on the outside. The exterior presentation of your building is the first point of contact with your customers. The second is the entrance so make sure an otherwise good looking building is not spoiled by a poor drive-in.

Have Interior Light

Note the contrast in the entrances of the two service stations shown on these pages. In the one we have a run-down building to begin with, the faulty layout being further emphasized by a broken door off its hinges, a crooked sign above, an old rain-water barrel that everlastingly is emptying its contents into the driveway, and besides, there is a car parked right in the doorway to make it difficult for another car to come in. The light is poor on the inside and that probably is why the car was run close to the doorway.

To make matters still worse there is not a soul to meet you and when you do chance to worm your way past the obstructing car, a grimy mechanic from

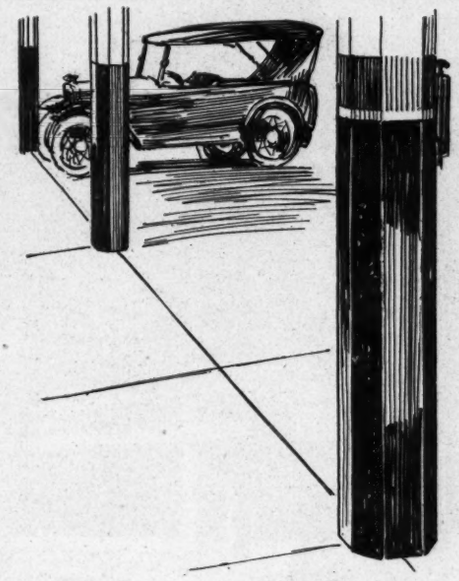
underneath the car gives you a look that makes you think you have entered the inner temple of the Sultan's harem. The points mentioned may be stretched a little, but it has been just such conditions that have given many of our service stations a black eye. But all service stations are not painted with the same brush and color.

Contrast what has gone on above with the illustration on the right, wherein is shown an up-to-the-minute service station entrance. Here, first of all, cleanliness prevails and the car owner immediately gets the impression that the same holds true of the shop and every other branch of the business. The sign overhead is neat and there is a service salesman to meet and direct you. Of course, in a smaller building the service salesman probably would be service manager and maybe superintendent. Anyway, you are met by someone and you feel as though you are going to be taken care of.

Good Lighting Helps

The good lighting facilities in this building help make the entrance inviting and note, also, that this dealer has wisely taken advantage of his entrance and placed a window full of accessories on the right to catch the car owner's eye as he stops and talks with the service man.

It is hard to lay down any rules as to just what the dealer should do so that he is sold on the fact that his house is clean. Every dealer knows his place best and knows the things he ought to do to tidy up. After all it is not difficult to check up on some of the things that might be done. For instance the dealer with some of his men might go across the street and see first how the place looks. Perhaps there are too many signs on it, the windows might look better if the casings were painted, there may be broken windows, perhaps the front of the building should be washed, the gasoline or air station at the curb might look better with a fresh coat of red paint and a host of other things. Jot them down in a note-book and then one by one have them done or let one of your men do them.



To make the posts in your building look new paint them white above and black or dark gray for about 6 ft. from the floor. Posts carrying fire extinguishers might be painted with a red band

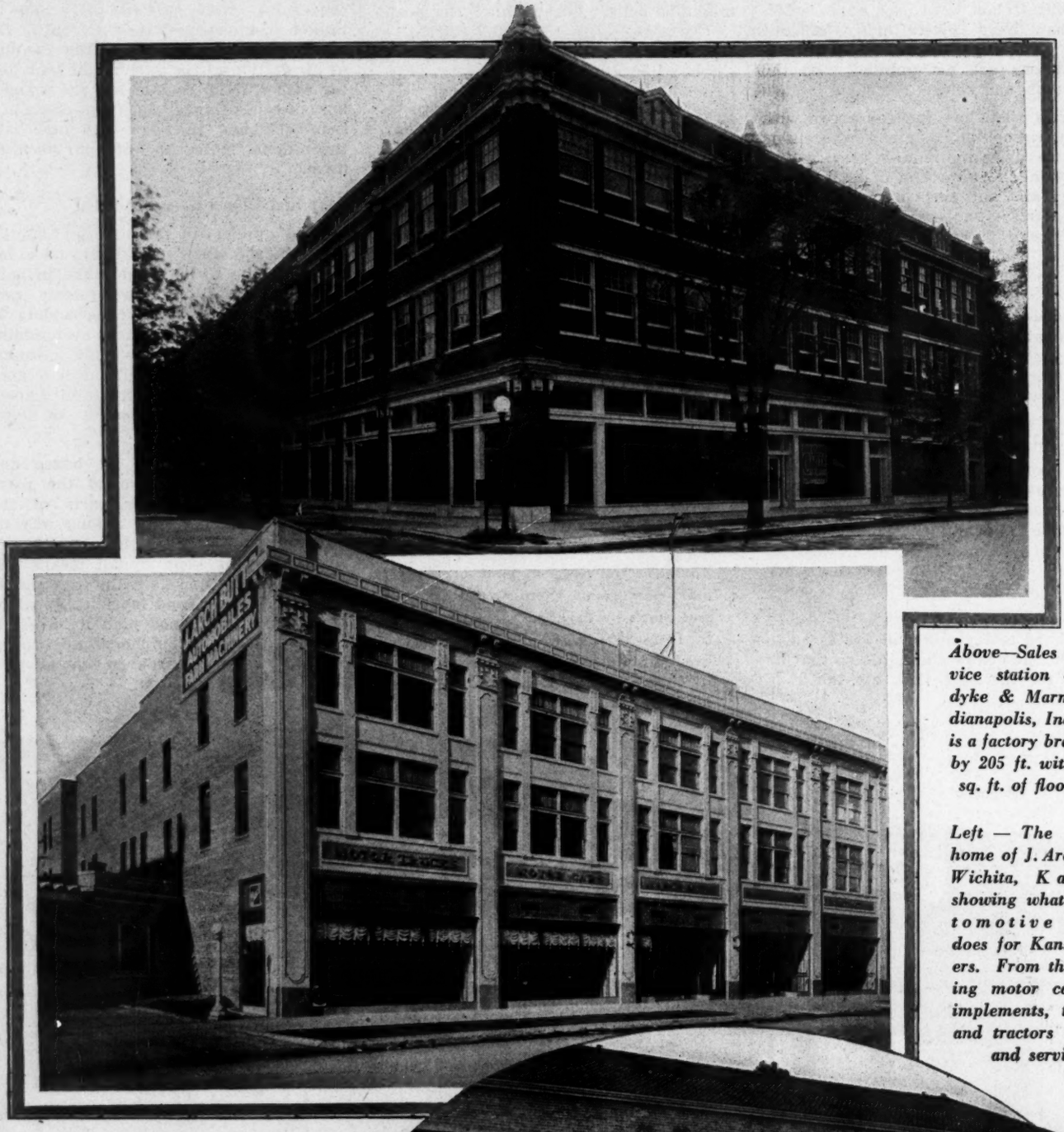
Soap and Elbow Grease Needed

What applies to the exterior applies also to the interior. Only, cleaning house on the inside might take in such things as installing new systems, new filing cabinets, a rest room, adding to the accessory department or even adding a department. But in the main, cleaning house for the dealer will mean a good application of the broom, soap, cleanser backed by a good amount of elbow grease.

It's a temptation to let boxes and excelsior accumulate around the parts department or in other parts of the building and these go a long way toward making a place look untidy. If boxes must be kept, by all means pile them up neatly and keep the excelsior in one of the boxes, and label it. Speaking of labels, it is a good plan to invest in one of the outfits butchers and grocers use to write show cards, so that all your signs will look uniform.

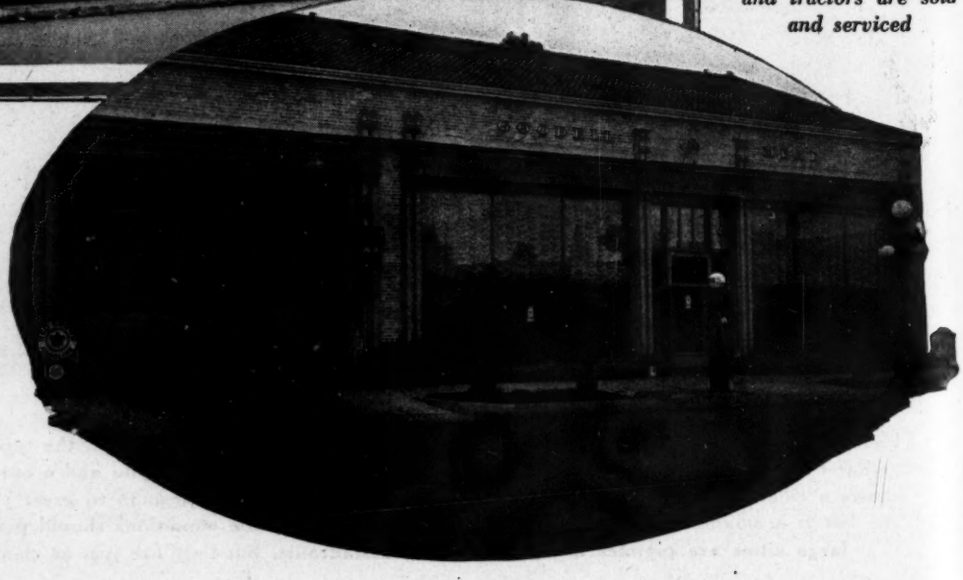
Here are two pictures worthy of considerable attention. On the left is shown the type of service station entrance altogether too frequent—small, dirty, broken door hinges, no one to meet you and a car blocks the way. The other view shows a clean, attractive entrance, with the service manager or salesman to greet you. Just because the building on the left is a smaller institution, it is no reason why intolerable conditions should prevail. Many waffle parlors in our large cities are pigmies alongside the big restaurants, but they are just as clean and just as efficiently run

By Their Buildings You Shall Know Them



Above—Sales and service station of Nordyke & Marmon, Indianapolis, Ind. This is a factory branch 113 by 205 ft. with 54,051 sq. ft. of floor space

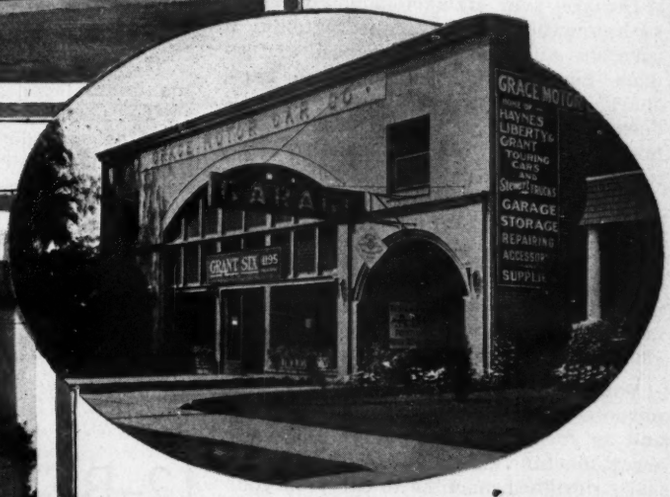
Left — The palatial home of J. Arch Butts, Wichita, Kansas, showing what the automotive business does for Kansas dealers. From this building motor car, farm implements, trucks and tractors are sold and serviced



Garage and salesroom of the Goodell & Mead, Inc., Pasadena, Cal. The sales room is in front and the garage is entered through an arch and rear court. The building is faced with buff brick, roof is green tile and the trimmings are painted green. Note the shrubbery work along the windows

Some Representative Exteriors of Sales and Service Buildings, Both Large and Small, From Which Dealers Might Take a Few Pointers to Get Attractive Buildings

The Bryson garage of Los Angeles, Cal., exceptionally attractive in garden work, with a well kept lawn and plenty of flowers. The building has a capacity of 55 cars



Another Pasadena, Cal., garage, the Grace Motor Car Co. The front is of gray brick and there is an entrance and exit on opposite sides. Note the flowers and shrubs

Above, the rather odd-looking El Camino garage located at King City, Cal., which is 50 by 300 feet

A neat and attractive-looking sales and service station that answers quite well the requirements of the average dealer in the small town. This is the Beggs, Okla., branch of the X. R. Gill Co., Okmulgee, Okla.

SEVEN WAYS TO PROMOTE

Better Buildings—Better Equipment—Systematizing Service—Helping the

1—BETTER BUILDINGS

BY B. M. IKERT

AN automobile building to be 100 per cent efficient must be carefully planned—it is more than so many square feet of floor space—it should be considered a delicately adjusted tool—the most important and most expensive the dealer has.

Did you ever stand, fascinated, before an automatic screw machine, watching it turn out with unbelievable speed and almost human intelligence, grease cups, spark plug shells or similar parts It does in so many seconds what would take many of us almost as many hours to do on an engine lathe and it does it with practically no attention.

The superiority in productiveness of the screw machine over the engine lathe is explained by the fact that the former is built to do a particular thing and the latter to do many things. The increased efficiency is due to specialization.

Your new building is for a particular purpose—for your automotive business, and as such should be in the automatic screw machine class. It should be a specially designed machine to carry on your business and as such will naturally differ from the building machine any other dealer in town might want.

In these days of soaring building costs it is highly desirable to get the most for your money by erecting as efficient a building machine as possible, not only to save in the initial expenditure by making a smaller building do, but also to gain in operation by having a structure which has a maximum sales pulling and holding power and yet which takes the least labor, from cellar to garret, to run.

Space saving begins further back than most dealers realize—it goes back to the principal fundamental—policy.

It should be based on the dealer's creed which for illustration may be stated as follows:

"I am in business to make money.

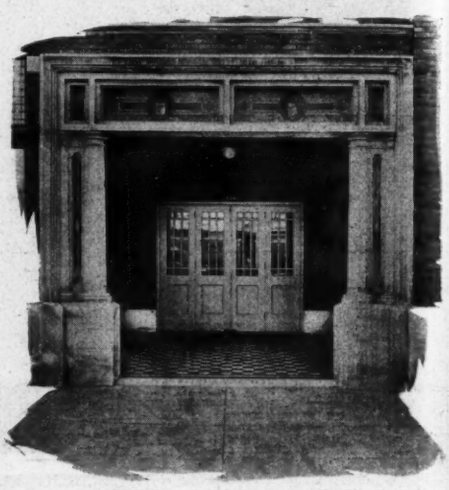
"I will accomplish this by doing a maximum business at a minimum cost.

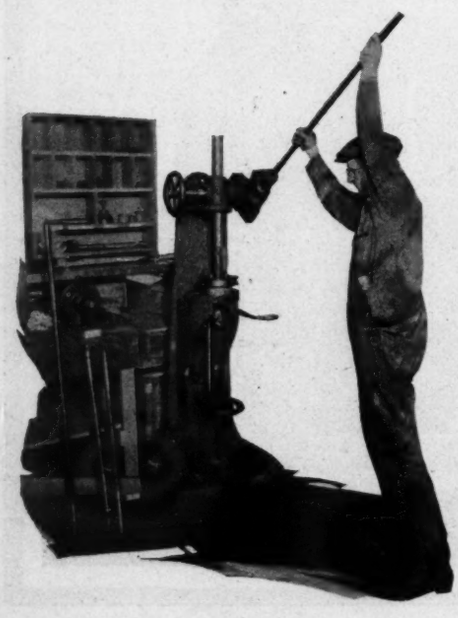
"To obtain maximum business my building exterior and interior must be designed to draw trade and hold it. It must be pleasant within so that customers will linger.

"It must be convenient in every detail—to bring and hold trade.

"It must aid and not hinder the work of my employees so that my customers may be served with dispatch and economy to them and to me."

There is not space to go further into the matter of policy, but it should be plain that the building is a means to an business. It should be equally plain that until we know exactly what the aim is, it is impossible to design a building to fit it and the business machine cannot be fully efficient until the building suits the policy. When this is accomplished the building may be considered 100 per cent efficient.





2-BETTER SHOP EQUIPMENT

BETTER shop equipment logically follows a better automotive service building. From the above article on better buildings we have seen that better results are to be had when a building is designed to do certain definite things. In the same way better results are to be had from the shop when it is tooled up with devices that are designed to do certain things.

As more and more automotive apparatus comes into use our repair shops and service stations must be called upon to perform operations not only better but in much less time. This will mean installation of automotive equipment of every nature, which must be done to hold customers and to get the recognition of manufacturers.

It stands to reason that a car manufacturer, say, who has thousands or millions of dollars tied up in a plant and machinery to make a product as good as it physically is possible to make that product is not willing to see it go out and kept in commission by the hammer and monkey-wrench variety of repair shop. And so it is becoming more and more the custom for the makers to insist that their service stations install the sort of equipment recommended by the factory, or equipment from which it is sure good service work can be had for their cars.

Labor saving machinery in spite of its first cost will pay for itself in the long run. Of course, the dealer's field must be sized up in order to see to just what extent it is permissible to invest in machinery and other equipment. But the dealer must look ahead, he must think of the next few years and bear in mind that the way in which he is giving his present service will dictate largely his new sales or repeat sales.

One of the best ways to hold customers year in and year out is to give them the right service and they soon show whether this service is the result of good equipment along with a good house policy. This is not to say that customers should be allowed in the shop, but they might be made to know in some manner that part of the dealer's service success is due to labor saving equipment.

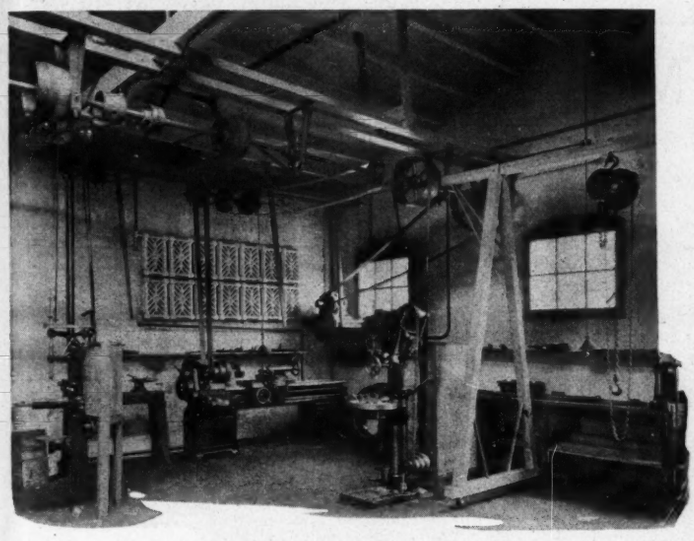
Labor-saving equipment does not only mean that the mechanic's time is saved on a job, but it also means that the job is better done, generally speaking. Take bearing work. It takes a pretty good man many hours to scrape in a set of bearings and even when he is all through he may not abe absolutely sure that the job is as good as it can be done.

YOUR SUMMER SERVICE

Employees — Better Parts Business — Instructing Customers — Enlarging

Nowodays on some engines the bearings can be burned in by machinery and later run in on the belt, after which it is possible to watch the action of the pistons and bearings to detect tendencies toward scoring cylinder walls. Thus any trouble will manifest itself before the engine is placed in the car and the amount of time saved is obvious.

There are many other devices, including apparatus like piston aligners, engine stands, axle stands, portable benches, overhead wash racks, battery turntables, tire changers, arbor presses, hoists, grinders, valve grinding outfits, drill presses, special reamers and wrenches, cleaning tanks, radiator repair outfits, and hosts of other things too numerous to mention with which the modern service station can fortify itself against the onslaught of the big job to keep going cars, trucks and tractors.



It's a great feeling to know that when a job leaves your place you know it is right. And the way to get this feeling hinges largely on good equipment. Mechanics are a big part of the job, to be sure, but good equipment helps a poor workman.

3—SYSTEMATIZING SERVICE

NO successful business is carried on nowadays without system. There cannot be uniformity in the automotive dealers business if it is not run along some well defined plan. The plan or system, as we might choose to call it, may not be very complicated, it may be just a matter of a few forms, but there must be a regular order of procedure behind it, or the place would not continue to do business so far as making money is concerned.

Every part of the organization must work in harmony with the others. The routing of a job through the service station cannot be properly handled if the building is not so arranged that progressive methods of assembly or shop operations can be followed out. Neither can a job be turned out on time, if there is not the right sort of co-operation with the parts department, or if the absence of labor-saving equipment makes it necessary for one or more mechanics to abandon their immediate jobs to help out on some other.

The systematizing of service means that every car owner must be treated in the same way, that is, a line must not be drawn anywhere. The system should be flexible enough so that the chronic "kickers" receive the same good attention as the customers inclined to look favorably upon the establishment. There always will be a few customers hard to handle, but there should be no deviation from the general rules so far as giving them attention is concerned. It's a part of the system.

Good system means that the service recording methods will be reduced to the simplest forms. It is not always the concern that has the largest number of forms and blanks that has the most efficient system. Four forms are enough and we know of instances where just two are used. For a repair transaction four forms are enough to provide an accurate record. These are—a repair contract and work order, time card, material requisition and a summary of work order showing wholesale and retail costs.

The methods, of course, must be worked out by each concern to fit its conditions, but the mistake is too often made in assuming that getting a service station on a systematic basis involves a lot of "red tape."

Systematizing service simply means that the dealer knows from one day to another where he stands. At the end of a month he will know whether or not any particular department is making or losing money. He can go further and tell from his records just why a department is making or losing. Without system this is not possible.

Systematizing service means also that the dealer will departmentize his business. It is far easier to keep track of the profits and loss of the tire-repair department, the shops, the parts department, etc., if the records for these are kept separate. With the separate records of each department before him the dealer can play one department against the other and in this way balance up his whole organization.

In a large organization it is inevitable that there should be a great deal of specialization. Experts in many lines may be developed and there will be one man,

for instance, who makes a specialty of radiator work, another whose specialty is tuning an engine, while still another can jerk out and replace a faulty transmission in less time than any other man in the organization. By giving out the work in such a manner that each specialist gets the work to which he is best adapted, there will not only be a reduction in the repair bill, but things generally will work out better.

Also, when there is the proper system carried out, the service manager will know that when the car or truck is delivered into the customer's hands it is right and there is no danger of a comeback. If the right system has been followed from the time the car was brought in for adjustment or repair until it is delivered to him there should be no fear on the part of anyone who had anything to do with the work.

The methods you use in working with your men form a vital part of your system of giving service. Far better results are possible when the men in your organization are made to feel that they are a necessary cog in the machine. So it should be a part of your system to arrange for little weekly or semi-weekly meetings of the men for the talking over of things relating to the business.

4—TALK TO YOUR MEN

IF ever the adage "In union there is strength" proves out well it is the getting together of the men in a service organization to weld them into business. The days are gone when men used to refer to their places of employment as though they were "just working there."

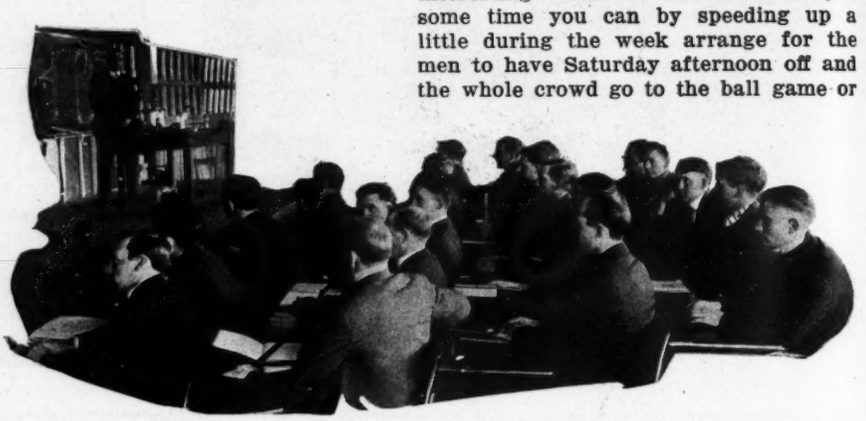
Most men like to be told that their work is satisfactory and that they are being looked up to as a necessary part in keeping the service machine going. The personnel of an organization is as highly important to the successful rendering of service as the right kind of building or labor-saving machinery.

If you mechanics or other workmen are made a little more familiar with the problems that must be met, their sense of responsibility is greatly awakened. They must be shown that as the business grows, they, too, must grow with it. Industrial training has tended to stabilize labor and has enabled the employee to make better wages, increase his production and instead of floating from job to job he sticks.

Education never stops. We learn every day in our lives an education should be one of the big things to think of in connection with the proper running of a service station. It is a great achievement for a dealer or service manager to be able to say that all his men swear by him. Working with the men is one of the secrets of cementing them to you. A bonus system in the repair shop often works wonders. But the real idea of fellowship is developed at meetings of the men, at which time the dealer himself or someone else directly or indirectly connected with the work gives a little talk. The men should be given a chance for expression. Workers when given a chance to state their views on a subject very soon get the idea fixed in their minds that they are vital, or can be made so in the welfare of the business.

The dealer can do a whole lot by personally getting acquainted with the men and call them Bill and Harry. Too often the dealer leaves it to the foreman of the shop to hold the good-will of his employees, but you will get a strangle hold on them, if you as the owner or manager of the place take an interest in them. The men like to know that the boss is a real fellow and perfectly human.

When you know that a certain expert from the factory or some place else is coming to your place, arrange for a meeting of the men and let Mr. Expert give them a talk. He may be an ignition specialist or a production manager, at any rate, it is pretty sure he will have an interesting word for the men. Maybe some time you can by speeding up a little during the week arrange for the men to have Saturday afternoon off and the whole crowd go to the ball game or fishing, or have a family picnic. Get the men enthusiastic about their work and one way to do it is to talk to them often, study with them, start a bowling team, or do anything to let them know you are for them.

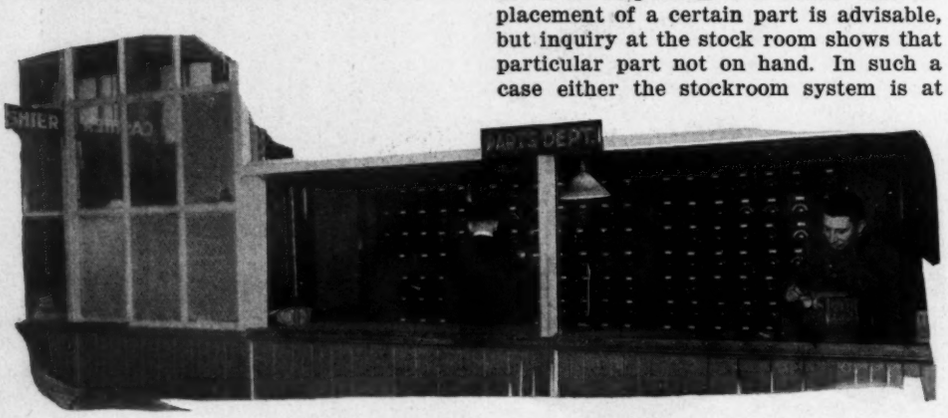


5—BETTER PARTS BUSINESS

IF there is anything that can hold up a service job it is the lack of parts. Very often after a job has been taken down on inspection it is found that replacement of a certain part is advisable, but inquiry at the stock room shows that particular part not on hand. In such a case either the stockroom system is at fault or the factory is slow in coming through on parts, or both.

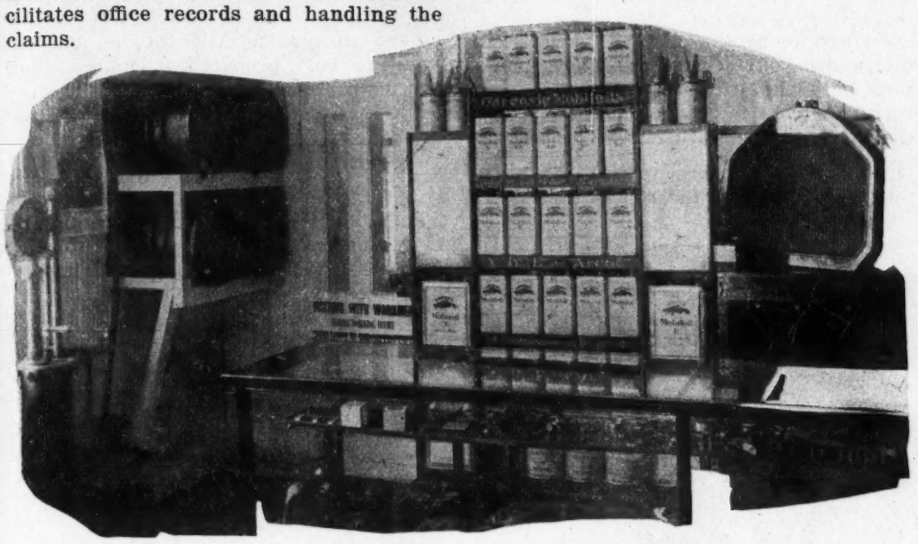
Many factories complain that dealers do not co-operate with them sufficiently on parts and as a general thing dealers and repair men must familiarize themselves much more with the manufacturers' parts catalog. These catalogs are not to be filed away on a shelf. Frequent reference to them will save much time and money and speed up service.

When ordering parts do not take anything for granted. The men at the factory are but human and cannot read between the lines of your letter or telegram. Your order is but one of several hundred the factory might get in a day and it is important that you tell everything necessary. Then the man at the factory filling the order will not be in



doubt as to what you want or how many you want.

The same thought is necessary when parts are returned for credit. A claim should cover one part or parts from one car only. If the claim covers two cars or parts from two cars separate claims should be made out for each. This facilitates office records and handling the claims.



6—TEACH NEW CUSTOMERS

MUCH of the so-called "free service" can be eliminated if the dealer makes sure that his new customers, especially those who are buying cars for the first time are properly taught, not only to drive their cars, but to observe the common rules applicable to any piece of machinery as complicated as the modern motor car.

While the instruction books furnished with most cars are fairly complete in telling owners what to do, the information can be supplemented greatly by personal instruction. New owners in their enthusiasm often forget to renew the oil in the crankcase and before long the car comes to the service station with the bearings burned out or the cylinder walls scored. Had such owners been sufficiently impressed with the importance of proper lubrication of their engines, it is quite sure trouble of this kind would be scarce.

Often you will find owners who do not know when their engine is not hitting on all cylinders. We do not have to tell here the evils resulting from running with an engine that is but partially firing on all cylinders. It takes but a few minutes of the dealer's or service man's time to show an owner, by actual demonstration, how an engine performs when hitting on a few cylinders only.

All service stations have had owners drive in and state that the car seems to jerk when the trouble was only a dirty plug, which any owner easily could have remedied, had he known the symptoms.

7—ADD A DEPARTMENT

THE promotion of any business usually has linked up with it somewhere the addition of a department. It means simply planting more trees in your orchard to bear fruit for you later on. Of course you must look after the trees and so you also must look after the new department. The latter might be accessories, a vulcanizing department, battery shop, starting and lighting work, or anything else that has to do with maintenance.

Adding a department is not so difficult if the dealer already has a department that is related. For instance, if you at present do storage battery work, it is quite feasible to round out your line and add the department for starting and lighting work, including also ignition.

Investigation shows that the greater share of automotive service work centers around the electrical system, because it is the least understood by the layman. Thus, it would appear entirely feasible for the dealer to think seriously of adding the electrical department to his business.

Whatever the dealer does, he should be sure when adding a department to push it the same as he does the others.

Service Work You Don't Get

When You Sell a Customer a Car Also Sell Him the Idea That You Are the One Who Should Do His Service Work

DO you, Mr. Dealer, get all the service work you are rightfully entitled to? Do the customers to whom you sell cars believe in you implicitly and bring their troubles to you for solution or do they find that they get better service from some other party who perhaps does nothing but service work? If so, you are losing out on a phase of your business that is capable of bringing in respectable financial returns. Your service department should be able to give just as good service as the service specialist in fact, since your service department handles only the cars you sell, the work turned out by your man should be better than any other man in town can do.

Do your customers realize this? Do they accept you as the service specialist on the cars you sell? If they do feel that you are best prepared to handle their service problems, do they bring the work to you? It is possible that the kindliest of feelings do not exist between you and your customers.

Perhaps the car owner feels that your man did not instruct him regarding the operation of the various parts of the car, and because of neglect so occasioned, he has been caused a lot of unnecessary grief. His feelings are hurt, if this is the case, and his service work goes to some one else as a result.

Perhaps, too, that your customers are

(*Continued on page* 29)

Mr. Motorist getting ready to do the dirty work. Full of confidence, he attacks the car. It'll only take about twenty minutes' time and the old bus will be as good as new

Raising the hood and formulating a plan of operation. The engine head must be removed. The fifteen bolts in the head will be out in a few minutes

Taking the bolts out of the head. The largest wrench in the place is a small 6 in. S wrench

The head off, the engine out. The parts are strewed around and the inside of the engine looks mighty mysterious

Scraping out the carbon with the best tool at hand. The Mrs.' carving knife wasn't at hand, hence the use of the wrench

The engine together and back in the car. A number of spare bolts have turned up from some place, but can't decide just where they should go

Getting Your Men Together

Much Good Results from Meetings When Men Are Made to Feel They Are Important Part of Organization

By A. RAWSON
Service Manager Reo Motor Car Co., New York, Newark Branch

ONE of the most important problems to be considered by service managers to-day is getting acquainted, working with and helping to promote the interest of the employee in general. This can be accomplished in a number of ways and the advantage that the employer derives from such co-operation is practically unlimited.

How often men come into a place looking for employment and tell what their experience is and after being placed and work assigned fall down completely, because they are not competent to do what they said they could do. The condition of the labor market to-day is at such a point that it is necessary to take other means in order to get competent help.

One of the best methods to do this is through education. It is very easy to organize the men and impress upon them the necessity of trying to learn the different operations. It is essential to put this in the right light before them so that they will not feel that they are being belittled. An hour or two a week devoted to such methods is of great benefit in getting the good-will and confidence of the employees.

Get your men together at a certain time and have a competent man talk. Lessons on engines, clutches, axles, electric systems, etc. Will help everyone

Talks by Competent Men

Have them meet at a certain time each week with a competent man to talk on different subjects. A great many small troubles can be eliminated such as clutch and brake adjustment and electrical troubles. Lessons on engines, carbureters, clutch, transmission, rear axles, brakes, spring adjustments, batteries and many others, will help every service manager.

His work depends on competent men under him and through education he will improve the work thus reducing the ultimate cost to the customer. Better work at a lower cost means more business and that is what we are all after.

One of the problems that will confront a service station incorporating such an idea would be where the men would not ask questions pertaining to that particular lesson. In other words if you have an electrical expert give a talk on general lighting and ignition trouble you will find that the average shop man does not understand how a coil can be boosted from 6 to 20,000 or more volts. They will not ask because they are afraid that it is a catch to find out what they know. They feel that if they admit they do not understand those things that they will lose their position. By getting them together and explaining to them that it is for the mutual benefit of employee as well as the employer — in a very short while they will realize — especially when they do not see any men fired — that they are going to profit from it and eventually will start in to take interest enough to devote time outside of the shop to study up different problems that they come in contact with.

Labor is skeptical and has to be shown but by winning their confidence, showing them they are a part and just as important a member of the organization as any one else, they will soon realize what it means to dig in and work with genuine interest.

MUCH of the success of the service manager depends on competent men under him and through education he will improve the work and also reduce the ultimate cost to the customer. Better work at a lower cost means more business and that is what we all are after.

If you have an electrical expert give a talk on general lighting and ignition trouble you will find that the average shop man does not understand how a coil can be boosted from 6 to 20,000 or more volts. They will not ask because they are afraid that it is a catch to find out what they know. They feel that if they admit they do not understand those things they will lose their jobs. Proper get-together meetings will be an incentive for the men to take interest enough to devote time outside of the shop for study.

Scheme Benefits All

I have found that an hour devoted to this work paying the men for that time places them in a position where they have to attend this school, has been a great profit. The cost of the labor for that time is nothing compared to the benefit the company obtains.

Another good method to get the good-will of the employees is through a social organization. Talk it over with the men, ask them what they think of it, let them handle it themselves and you will be surprised at the ideas that they will give which will be of benefit. In my organization I submitted the proposition to them and they are very enthusiastic about it. A prize was offered for the most logical name and this competition helped to stimulate interest in the idea. They have their own organization, elected their own officers and started the ball a-rolling by saving money.

Practically every man in the organization puts in a sum of money into this club each week and it is really surprising the interest that has been shown.

What About Parts?

How to Arrange and Keep Repair Parts Stock Systematically—Ladders in a Stockroom Waste Time; Racks Should Not be Over Eight Feet High

HARDLY any service or repair work is done in a day that does not involve the use of new parts in some form or other. It is, therefore, of paramount importance that the stock or parts room be properly maintained with an arrangement such that an order can be filled in the shortest time possible consistent with minimum cost and efficient handling.

In checking over your stockroom make sure that:

First—Your departments are located so that orders will flow through progressively.

Sesond—That the bins are economically located with reference to the available space, stock activities and weight of parts.

Third—That you have proper sizes and types of bins for various classes of parts.

Fourth—That there is proper binning of parts by model or item.

Fifth—That you have an accurate and quick method of locating parts.

Sixth—That highly finished parts are properly protected.

Every stockroom must have some sort of sales counter to take care of retail trade. Also, in smaller establishments it is advisable to locate the sales counter and the distribution counter to mechanics in the repairshop directly opposite each other so that in case but one person is handling the stockroom, he can watch both at the same time.

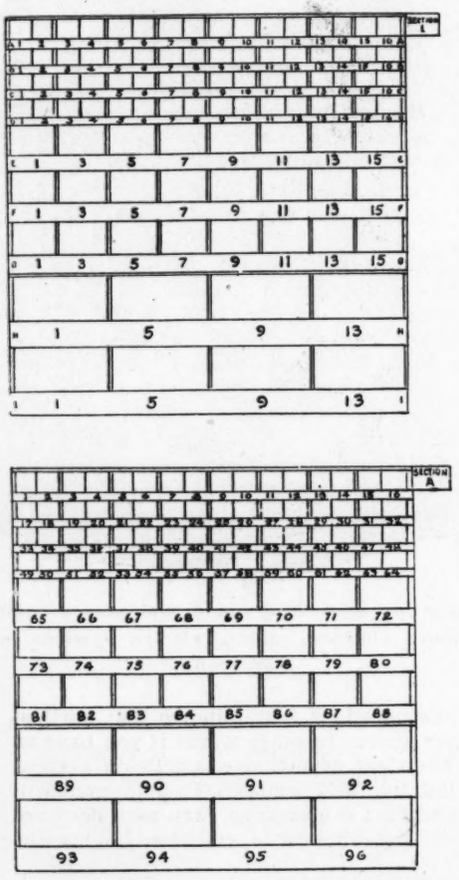
Aisle Through Stockroom

Bins should be so located that there is at least one aisle through the whole stockroom large enough to accommodate hand trucks for carrying the heavier parts. The sales counter should be placed as near the stock office as possible and also a wrapping counter, so as to avoid time lost in sending parts to the shipping department for wrapping in case of cash sales. This location also makes it easy to refer to the office records should occasion arise.

Proper marking of the bins is necessary for gaining rapidity in locating parts. The illustration herewith shows a right and wrong method of marking. Heretofore it generally has been the practice to letter each section separately and then to number the bins in the sections consecutively, as shown in the lower illustration. Repair parts should be divided up into their respective classes to facilitate binning. Essentially there are four classes, these being:

(1) Equipment for small parts.
(2) Equipment for medium parts.
(3) Equipment for heavy and bulky parts.
(4) Equipment for sheet metal parts.

Small repair parts are those common to electrical apparatus, carbureters, etc. There are on the market steel racks quite well suited for binning these small parts. Common practice is to divide the small metal drawers in these racks into six or eight compartments, which gives to the entire rack something like 1082 or 1440 different divisions. Each drawer in the rack should be provided with a pull handle and a lateral holder at the forward end.



In the upper illustration the stockroom is divided into sections or rows, each row carrying an alphabetical master letter. The rows or sections are then divided into bins and these bins are designated numerically. Thus, the stock part labelled E 13 can readily be found by going to Bin 13 in Section E. For further convenience, whereas the smallest bins are numbered regularly, in the case of the larger bins some of the numbers are dropped so that Bin 13 in section A is in about the same position as Bin 13 in Section I, although there are thirteen bins in Section A and only four in Section I. This is a much more convenient system than that illustrated in the lower picture where the bins merely are lettered numerically. In the latter system, a new stockkeeper would first have to familiarize himself thoroughly with the room before he could go quickly to any needed part

As to the type of bin best suited for the average stockroom, the open face variety is probably the best, as it saves both time and energy on the part of the stockroom keeper. Cabinets with drawers for handling heavy parts are quite inefficient because if the stock man has to open or close a drawer ten times in an hour and this drawer has to be pulled open a foot and requires 40 pounds to open it and 40 pounds to close it, then this man is doing 800 pounds of work in an hour, or in a ten-hour day 8,000 ft. pounds of work.

This means that the man does the equivalent of shoveling four tons of coal through a distance of 1 ft. in a day. The fatigue factor is very important in any establishment, as it is only by these means that many of our factories have been able to reach the high production they are now capable of with a limited amount of men.

Arrange Stock Efficiently

Just a word regarding the use of ladders in a storeroom. The latter in a storeroom is a time-loser, as it always is blocking the aisle, and it is much better to construct your racks in such a way that the highest point is not over 8 ft. from the floor.

Certain parts are in greater demand than others, and in arranging the stockroom the bins containing such parts should be placed near the main aisle as conveniently as possible. The aisles between the spaces of the bins can be varied above a limit of about 2½ ft. as the size of the parts to be handled increases. The bins containing heavy parts should be placed as near the shipping and receiving room as possible to avoid transporting the parts over a long distance.

In some stockrooms where space is limited it might be advisable to use a hanging rack for the storage of sheet metal parts like fenders, mud pans, etc. The chief objection to this kind of rack, however, is that it cannot readily be extended.

It is sometimes necessary to resort to this type of rack where it is necessary to store a certain amount of material in a limited amount of space. Racks of this kind should have the running strips, covered with a burlap pad in order to prevent damage to any of the painted surfaces.

Tooling Up for the Spring Drive

Means That Service Station Should Not Only Install Labor-Saving Machinery But Overhaul the Old Equipment

BY ROY E. BERG

WITH the coming of spring and the consequent rush of overhaul business comes the necessity of shop preparation, a comprehensive task. Tooling up the shop concerns not only the tools with which the overhaul work is done but it concerns every element in the shop that functions in the overhaul. The parts stock is not excepted.

The proper inventory should be made, the parts indexed so that their location can be determined by anyone in the establishment, familiar with the details of the indexing system. The shop machinery itself should be gone over, both the portable tools and the stationary kind, such as lathes, drill presses, axle stands and last but least by no means the line shafting.

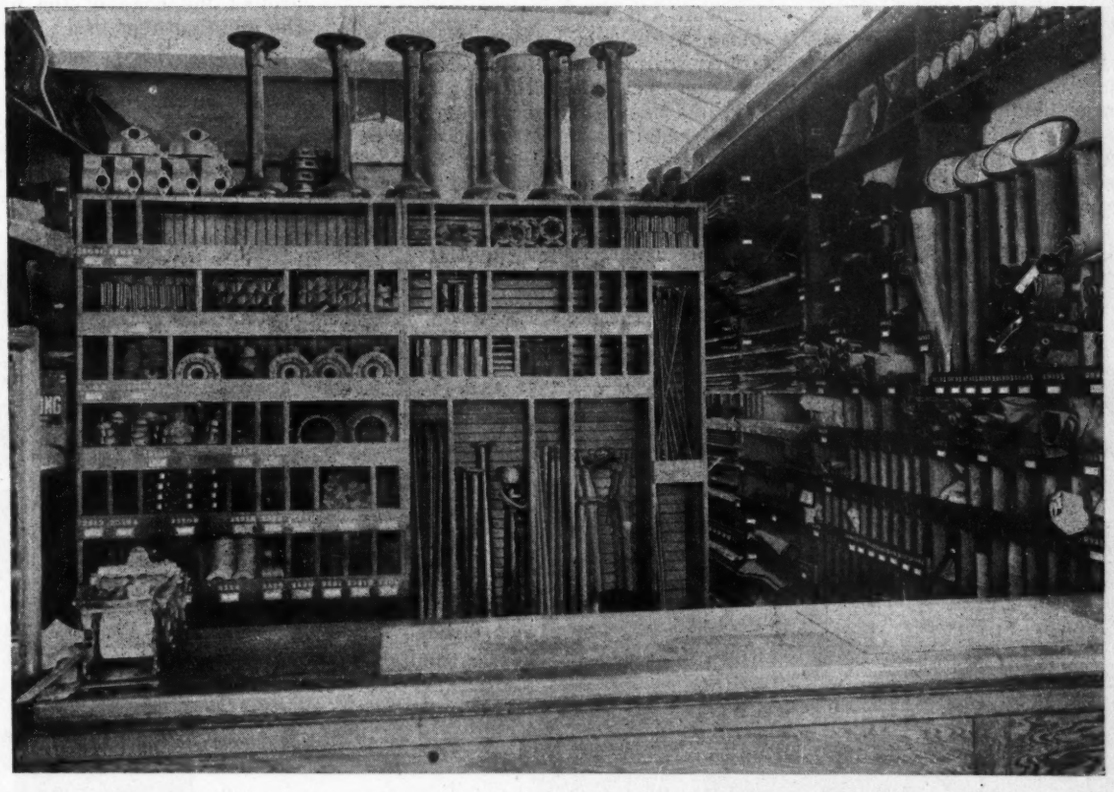
The whole question practically amounts to a spring house cleaning. The place to start is the roof. The overhead machinery stands a lot of uncalled for abuse during the year, and it is only fitting that it be given the proper attention at this time. How are the supports that hold the line shaft brackets? These brackets have the faculty of working loose, and about the worst thing that can happen in a shop is to have the line shafting fall down.

Then the line shaft brackets themselves. Are they operating as they should? How are the bearings of the brackets? Are the oil rings supplying oil to the bearings or are gummed up with dust as they are inclined to be. This will be a very good time to install the oil dripping pans under the bearings of the brackets, as you no doubt have promised yourself you would do.

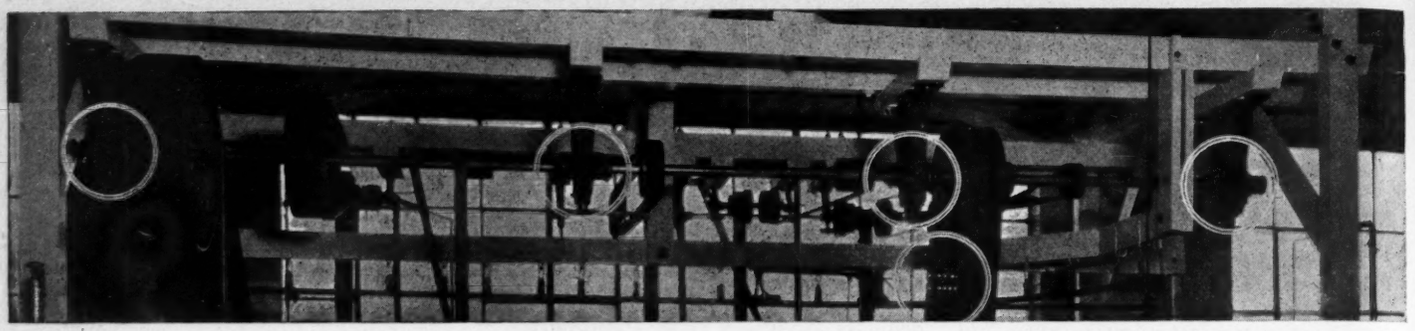
Providing that the floor of your shop is level, you can check up the alignment of the line shaft very easily. A shaft that runs several inches out of true at its ends is source of expense. Vibration and belt wear are noticeably affected when the line shaft is not perfectly straight. If the floor has a canter to it then a high spot of the floor should be picked out under the shaft and a common height established with the aid of a level. A plumb bob should then be used to line up the shaft from this established level.

Then a word regarding the belts, and the belt shifter levers for moving the belt from the fast to the loose pulley. The belt during the course of the year's run becomes laden with dirt and grease. Perhaps also the heavy use has made the belt stretch and it consequently needs a new lacing. A good belt dressing should be applied and the belt given a little care. Belting costs about $2.90 per running foot for 6 in. double ply material these days and if you can spend some time on your power transmission equipment and perhaps a few dollars fixing it up, you will probably make it last another season. Of course it is bad policy to try to get along another year with a belt that is so far gone that it gives constant trouble.

A dealer friend of the writers has been trying to get along with an old belt on his air compressor, and when



Tooling up for the spring drive not only implies that the tools themselves should be in good order but the stock of parts should be arranged systematically, properly cataloged so that reference to the bin for some particular part does not depend on the memory of one man in the shop



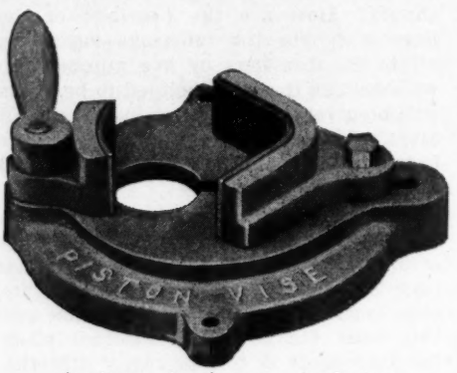
How often in a rush of repair work have you had to stop because the line shafting failed or because a belt pulley became inoperative or because of a belt splice failure. The parts shown in the small white circles should be looked over, oiled and tightened up to insure their proper operation during the coming season

he was told that people dreaded to come to his place for air, simply because it was necessary for some mechanic to run back in the shop and hook the belt up on the pulley, thus occasioning a delay, he bought a new belt. Belt lacing should be given careful attention. On a belt that is to run over the same pulley until its days are done, it probably is best to have it spliced when it is first put in. A joint of this kind can be made, that is practically as strong as the leather itself.

Then if the belt ever becomes thrown off the pulley due to some excessive overload and resulting in a badly mangled belt, it can very easily be repaired by putting in some patented lacer, having a detachable interlocking joint that makes it possible to slip the belt over the pulley and then fasten it.

Lathes Need Attention

After the job of overhauling the overhead equipment is completed, the stationary machinery should be tackled next. Perhaps you think that there isn't much with this equipment. Supposing you have been doing some grinding on your lathe during the past year. Where has all this dust gone? Grinding dust is the bane of a lathe's life. Accuracy is a questionable factor, once a lathe has been carelessly operated with grinding dust flying around.



A piston vise for any sized piston

Lathe centers are generally abused to the point where operation with them becomes a nuisance. A turning job performed with centers that are all burned up, from operation with too much pressure on the tail center must generally be finished up afterwards because it is not accurate to be called finished. So a universal grinding attachment for the lathe is not an unprofitable investment, when the thought is borne in mind that it affects a change for the better in all the work done on the lathe.

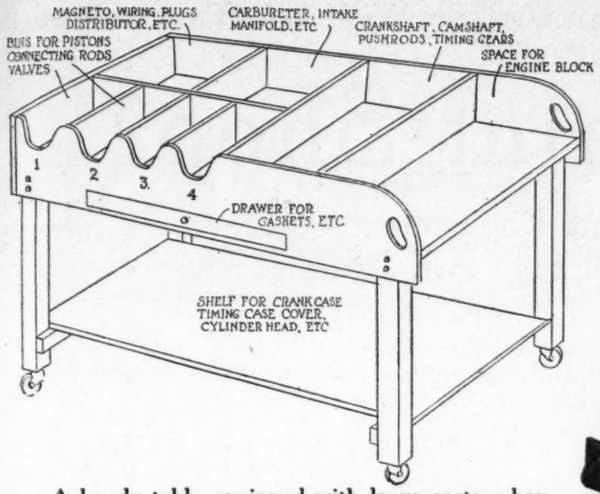
Perhaps it will be well to add a few change gears to the lathe set this year in order to accommodate a greater variety of work. Very often finds occasion to turn up an odd sized screw thread and a full set of change gears comes in handy at this time. Another point that helps out a good deal in connection with the machine work is the way in which the reference cuts, illustrations and illustrations are fixed up.

Save Wiring Diagrams and Data

For example, one dealer we have in mind makes it a practice of keeping all the wiring diagrams that appear in MOTOR AGE. He redraws these diagrams to a standard size, pastes the drawing on a heavy cardboard and varnishes the whole affair. Then a brass binding is put around the edge of the cardboard and the diagram kept in a standard file with the others. The same can be applied to numerous other things. For instance, tables showing the standard screw thread sizes of various bolts and nuts are referred to very often in the shop and the table of reference is apt to wear out unless some precautionary methods are adopted.

To the left a connectng rod aligner and tester. A rubber expanding plug for radiator testing is shown to the right

Straightening an axle shaft. A machine like this can be used for a number of purposes



A handy table equipped with large casters having compartments in which the parts may be placed. The table is wheeled up along side the car

The small tools that go with the lathe are rather hard to keep in proper trim. How often have you ground up a number of drills and when through with the task, felt dissatisfied because they were not ground accurately. A small drill holder that clamps to the bed of the grinder insures that the drill will be ground as it should be.

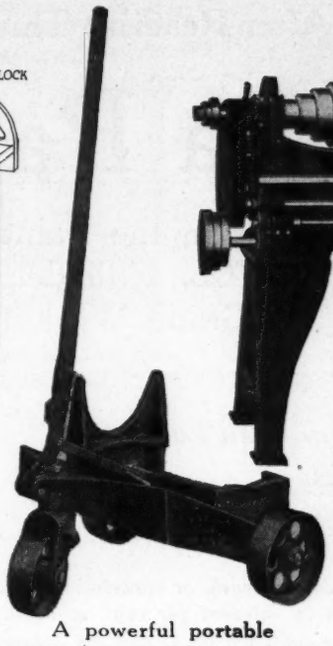
Get a Drill Grinding Tool

Another thing to remember in connection with a drill grinding tool is that one man can grind up about five times as many drills in the same time with one of these attachments as he can without.

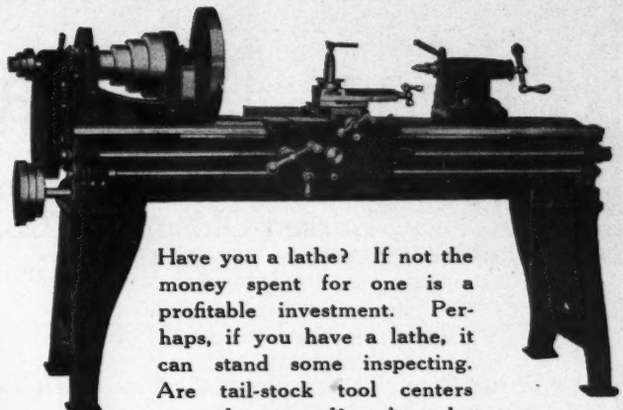
The small tools in general such as files, wrenches, chisels, screwdrivers, can be improved by touching them up with acid or the grindstone as the case may be. Many mechanics have the idea that a file is done once the cutting edges are filled with metal. This is surely an expensive idea, for a card file, will clean out the teeth of the file and permit its greater use.

The tools to be added to the shop's present layout of tools, of course, is a matter that the proprietor must decide.

An axle stand saves much time on the repair of axles



A powerful portable dolly



Have you a lathe? If not the money spent for one is a profitable investment. Perhaps, if you have a lathe, it can stand some inspecting. Are tail-stock tool centers properly ground? Are the dogs equipped with good fastening centers so that the socket wrench will operate them? Does the apron run true? Is the belt for the drive of the apron strong enough to last another season?

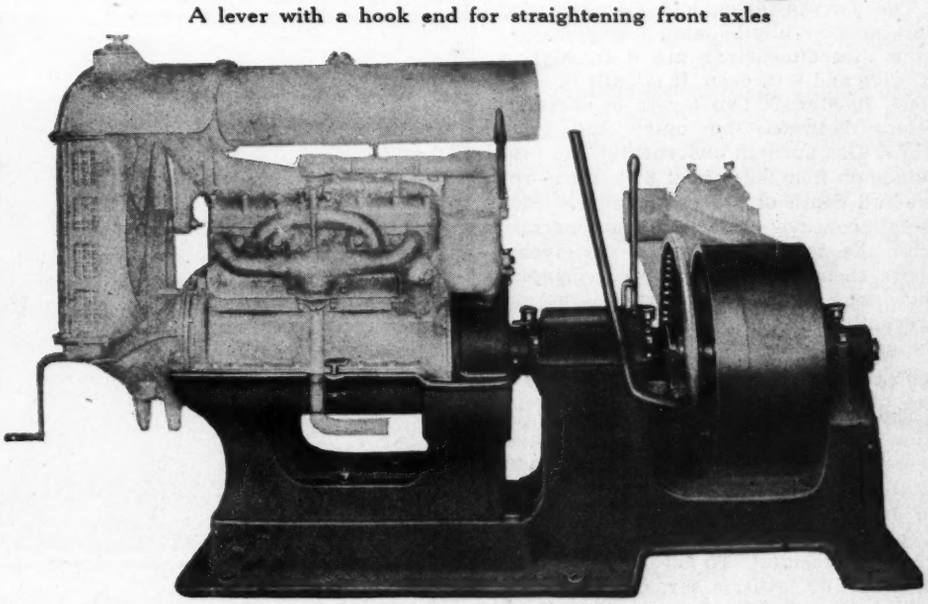
We have spoken before of the advisability of adding labor saving machinery. The point can not be over emphasized. Such tools as axle straighteners, arbor presses, engine stands, are worth their weight in gold to some dealer establishments, in manufacturing localities, where men are extremely hard to find. After all the big idea of this specialized tool equipment is to increase the efficiency and output of the men, making it possible for one man to do what three men could not do, when his supply of tools is sufficient.

The interior appearance of the service station itself is something that can well afford a great deal of thought. A room painted up in some dark and unreflecting color is conducive toward inaccuracy in the work. Artificial lighting has been developed to a high degree of efficiency but who can argue against a wholesale quantity of daylight? Which brings us to the proper color for the interior of the service station. White? Why not?

Clean Work Follows Clean Shops

The interior of a service station need not be classed together with grease and dirt. The interior of one very well known service station in a prominent western town is white tiled and the work turned out in this establishment is as good as any factory ever turned out. Clean shops, and clean cars follow as a matter of course. We do not recommend a white tiled interior but we do recommend a white interior.

A lever with a hook end for straightening front axles



A Universal burning-in stand

We Feel Sure Many Dealers After Reading This Article Will Ask Themselves—

Why Not a Paint Shop?

Labor-Saving Devices in the Paint Department of the Larsen-Oldsmobile Co., Philadelphia, Are Putting Through High Grade Work in Short Time

Speeding Up the Paint Shop With Labor-Saving Devices

A large enameling oven bakes enameled parts, insuring perfection of color and finish, in an hour and a half.

Chasses are painted to look like new, an air brush, or spraying machine giving two coats in half an hour, or fifteen minutes per coat, as against sixteen hours consumed in applying four coats by hand—and the sprayed paint is more evenly distributed over the metal surfaces and sticks better than when put on by hand brush.

Wheels, especially wire wheels, when removed from the car and placed on jacks after being cleaned, are painted with the air brush in one hour per set, as against seven and one-half hours by hand brush.

ONE of the important branches of service is the paint and trim department but in order to make it a profitable part of the business it is necessary that time-saving methods be used.

An enameling oven for baking fenders, splash-pans, hoods, lamps and the like is a feature of the completely equipped dealers' and distributors' service departments in the paint department. It is a device growing in popularity and some service managers feel that because of the uniformly excellent jobs turned out when an expert is doing the baking, the oven now is a necessity for high class trade.

The Larson-Oldsmobile Co., Philadelphia, successfully is using a large baking oven. Its dimensions are 8 ft. high, 6 ft. wide and 6 ft. deep. It is built of sheet steel, lined with two layers of sheet asbestos between the outer and inner walls. Gas burners underneath—the oven stands on four legs about 8 in. high—run the full depth of the receptacle and two metal concave deflectors run parallel with the burners, raised a few inches above them, catching whatever dripping there may be from the parts baking and preventing the drippings from entering the gas flames.

350 to 375 Degrees Best Heat

There are racks on the interior walls from which to suspend the larger parts to be baked, and shelves for parts smaller than fenders. There is a gage on one of the doors to indicate the degree of heat, and permit regulation, which is essential. To get the best enameling results, experts say, the heat must be maintained at from 350 to 375 deg.

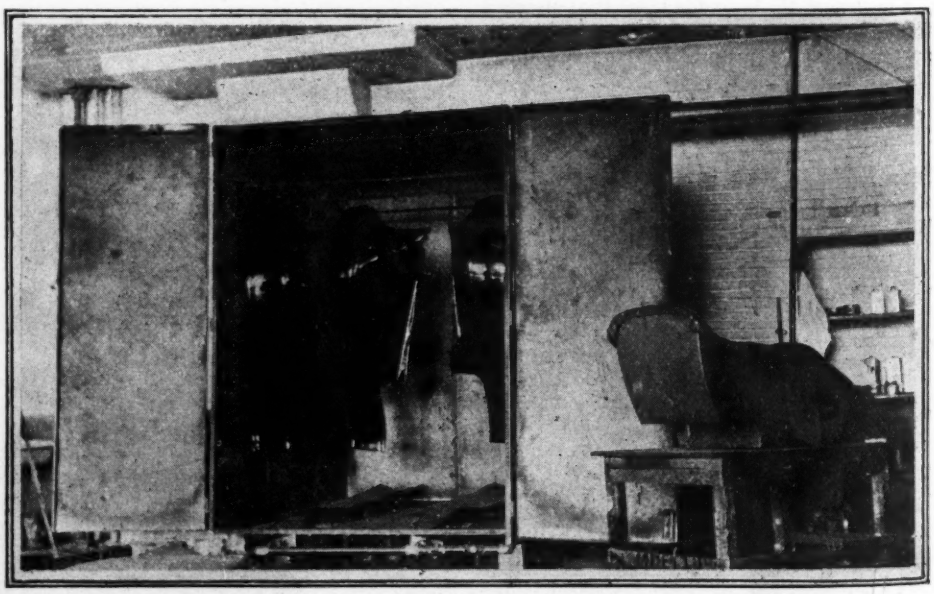
Baking usually lasts 1½ hrs. Each part baked has a first coat of enamel, which is thoroughly rubbed down before it is placed in the oven, and after the first coat has been baked the part receives its finishing coat, which also is baked.

The man running the oven has his problems. For instance, certain enameled parts when placed in the oven change color under heat but not all change in the same way, or at the same degree of heat. The baker has to have experience so he will know just how the different colors will change so they all will be the required shade after baking. That is, the baker must not only be somewhat of an artist, but must have had enough practice to get the "feel" of the job before he can produce the best results.

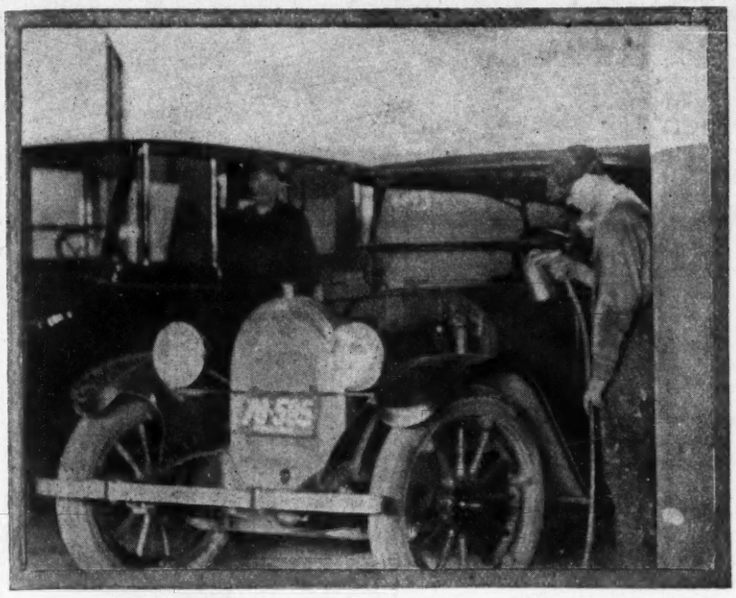
When a "straight" painting job comes through the fenders, splash-pans, lamps, hoods and all detachable metal parts are removed from the body of the car and put into a lye tank, 3 by 6 ft. placed near the bake oven. In the tank is a solution made of 50 lb. of caustic soda, and water, the mixture reaching more than two-thirds of the way to the top of the tank. The parts mentioned are left to soak for 8 hrs. in the tank, usually this cleaning process being accomplished at night. After the parts are put to soak preparatory to enameling and baking the stripped chassis is thoroughly cleaned, the wheels previously having been removed and placed on jacks for cleaning and painting.

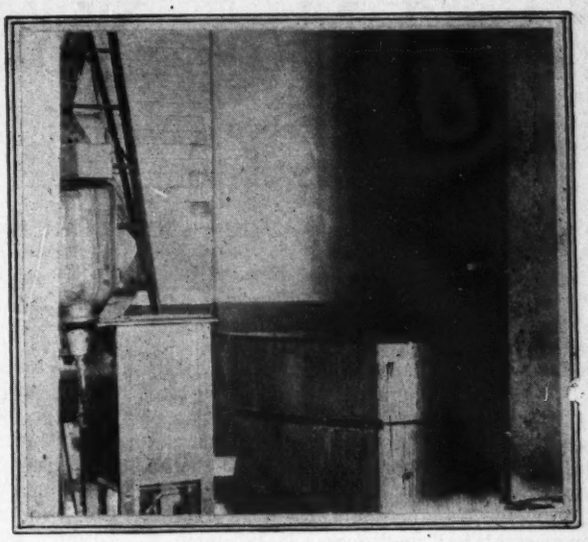
Body Painted With Hand Brushes

The body of the car is painted with hand brushes, but the chassis, wheels, especially wire wheels, nuts, bolts and other parts that hand brushes cannot reach conveniently, are painted with an air brush, or spraying machine operated by means of an air pressure pump situated on the floor below. Radiators also are coated with the sprayer.



This is the bake oven used by the Larson-Oldsmobile Co., which has made it possible to turn out finished enameled parts in 1½ hrs.





Top, left, workman using the air-brush and right, the tank used for soaking the parts over night preparatory to enameling in the bake oven

A good paint job is spoiled by shoddy upholstery and at rim department is almost a necessity. This is the trim department of the Larson-Oldsmobile Co.

Spraying has the advantage of putting the color on "solid" and evenly, there being no streaking, as is the case with the hand brush, even, occasionally in the hands of expert painters. The painter himself, plying the hand brush, does not know how many coats it will take to completely hide the old color and get the best results, especially when the new coat of paint is a different shade from the original coat.

Air Brush Saves Time

When using the air brush on the chassis and nuts, or bolts, the operator can lie on his back and finish the work more evenly, with more comfort and in much less time than by applying hand brushes. In operating the air brush from a standing posture, as, for instance, on the radiator and the upper portions of the chassis, it is held 2½ or 3 ft. away from the object.

As regards the advantage in time of the air brush over the hand brush. It takes 16 hrs. to paint a chassis properly by hand, applying four coats, the operation requiring 4 hrs. to each coat. Using an air brush, it is necessary to give the chassis but two coats, of 15 min. each. In other words, it takes ½ hr. with an air brush, as against 16 hrs. by hand, with two less coats, to get better results. Wire wheels, when removed from the car and placed on jacks after cleaning are painted with the air brush in 1 hr, per set, as against 17½ hrs. per set for a first-class hand brush job. The spray, however, cannot be used with advantage on the body painting job, as no matter how carefully the upholstering apparently is protected by means of cloths, tarpaulins, or paper, the spray from the air brush is almost sure to penetrate the protective covering and spatter the cushions. Experience has shown that, for best results, it takes from 50 to 60 hrs. for a "straight" painting job, inclusive of dressing the top and upholstered parts, and from 70 to 85 hrs. for a thorough "clean off and paint" job. The paint, sent forcefully and evenly from the air brush in a fine spray, sticks to the metal parts—the springs, for instance—such as no amount of rubbing in with the hand brush can accomplish.

Taking the body painting job in order, after the chassis has been stripped of the wheels and the parts to be baked in the enameling process, the operation is as follows:

1—Introductory cleaning and rubbing.
2—First coat—metal priming .
2—Second coat—glazing.
4—Third coat—filler.
5—Fourth coat—filler.
6—Fifth coat—filler.
7—Sixth coat—filler.
8—Seventh coat—filler.
9—Eighth coat—filler.
10—Rubbing with lump pumice stone until filler is smooth and color has been changed evenly over entire surface.
11—Ninth coat — opaque, lustreless ground color .
12—Tenth coat—original color. Careful rubbing.
13—Eleventh coat—color applied again. Careful rubbing.
14—Twelfth coat — varnish. Finely rubbed.
15—Thirteenth coat—finishing.

The rubbing alone, occupies from 12 to 15 hrs. Lump pumice stone is used for paint rubbing and powdered pumice for varnish rubbing. The rubbing of the parts to be enameled and baked, takes place on a special rubbing table placed near the oven. Usually the lye tank for cleaning is on one side of the oven and the rubbing table on the other.

Dust-Proof Finishing Room

There is an air-tight and dust-proof finishing room with excellent natural light from huge windows, to insure perfect work. Excellent artificial illumination also is used. A thermometer is watched to see that the temperature does not rise above 75 deg.

And Now Your Parlor

The Ever-Increasing Number of Women Drivers Demands That You Have One—See That It Is Worth While

By TOM WILDER

NOT very much has been said or written about Women's rooms. Once in a while some enthusiast lay aside a square of space in his garage and marks it "Ladies' rest room." Usually it is some waste corner that isn't suitable to anything else and is about the size of the proverbial hall bedroom. It becomes a women's room from the same reasons that the old negro's dog became a coon dog: "He yes' mus' be a coon-dorg, he ain't no other kin' of a dorg.

Then, too, the furnishings that are supplied in these box-like affairs are almost a joke. Garage men are mostly off on women's likes and dislikes if the places they fix up are any criterion. Most of them seem to think that they must appeal to a woman's desire for cleanliness so they scrape the floor and varnish it and paint the woodwork and walls the purest white that the paint man can produce.

But let us go back a little and see what are the reasons for this feeble though well meant effort to appeal to women. Have women demanded a room in the service station to be reserved for them? Would a garage owner, if he were asked by a thousand women, spend real hard cash and sacrifice real good space to their convenience? The answer is he wouldn't, and in most cases he doesn't but a few of them have had a hunch or heard someone say something and have figured that there might be something in it.

As a rule garage and service men don't realize what benefactors women really are: Mostly they think they are a nuisance. But the woman who drives her own car is almost totally dependent on the service man to keep her car running. Totally unmechanical herself or at least nine hundred and ninety-nine thousandths of her. She only knows that when she presses the button or pushes the lever she ought to get a certain reaction. If the reaction doesn't come the service man is the only person to whom she can tell her troubles.

Electric starters have made it possible for thousands of women to drive cars who otherwise would have never considered it for a moment, and again the electric starter because of its complexity has placed them more than ever at the mercy of the service man.

Every way we look we see women looming in increasing numbers as drivers of motor cars, and it is up to the garage and service station to take care of them in a way that will foster their patronage.

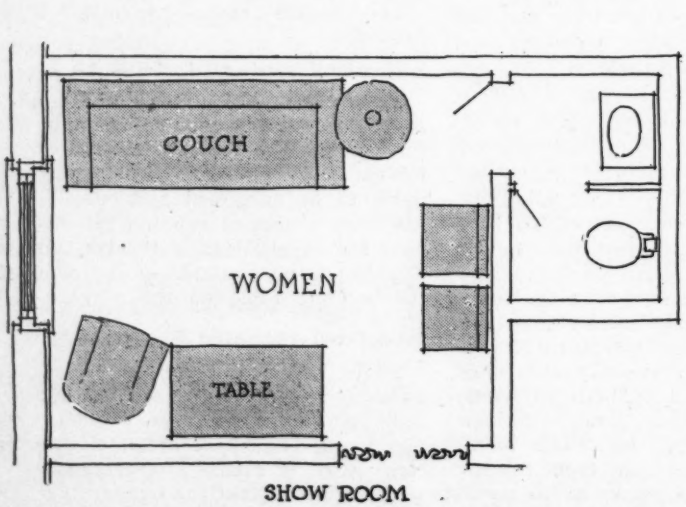
As a rule a woman is a good buyer, careful in most respects but keen for a bargain. If your rest room is attractive enough she will consider it a bargain or something thrown in with service for good measure.

Many of the trips women make to the service station are for slight adjustments that don't take long but still long enough so that if there is a pleasant place to kill the time or better still a few short story magazines so that the time will not be killed, they go away with the feeling that they have gained something rather than that they have lost the time and the price of the repair combined.

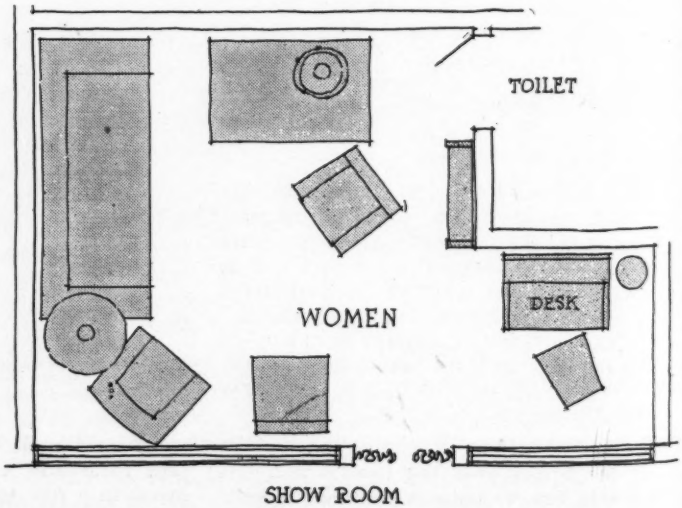
A woman must always be handled psychologically. The mere fact that she will give her last cent or the coat that keeps her warm to the person who has her confidence and convinces her he is sincere is a cue to the garage man to work upon her sentimentally in little ways that are not much in themselves but look big to her.

It will take a little study to discover what things make a hit with your particular customers. It will not do to assume that all the women are addicted to

Make the entrance attractive, even inviting. Substitute some pleasing draperies for the glass door. The warm glow of light from a pretty lamp shining through the draperies will do the rest



SHOW ROOM



SHOW ROOM

A room with an outside window is preferable, but if ventilation is taken care of so that the air is fresh, the window may be dispensed with though good artificial lights should be supplied in its place

A telephone extension in the rest room is almost as essential and covers a multitude of neglects in other lines

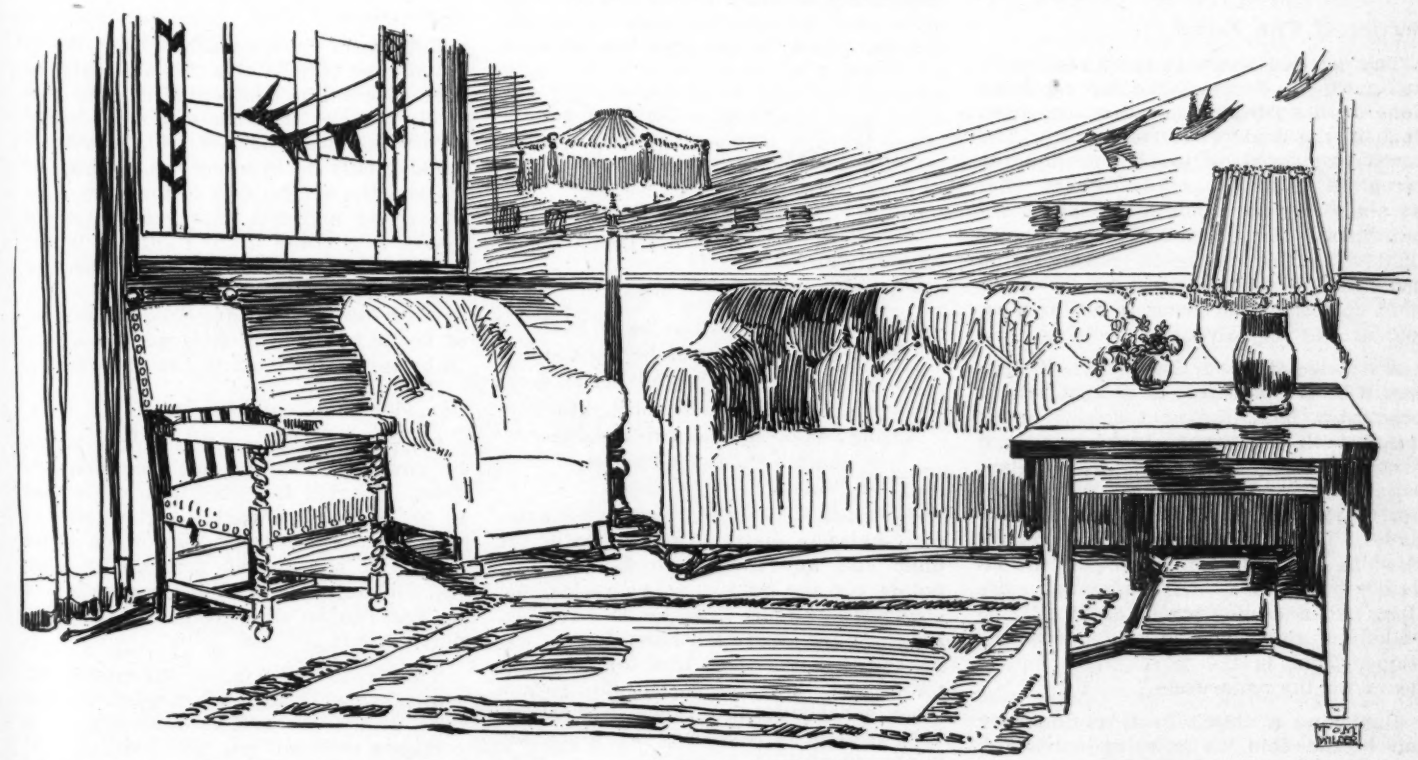
snappy stories and the dressing table. In fact quite a few insist on low heeled shoes, read the Atlantic Monthly and positively refuse to powder their noses, even to prevent sunburn. A little discretion and fairly good variety in the way of reading material will be better than a few of the very latest things all in one line. Give 'em a little highbrow stuff even though you don't know what it means yourself and have to call in an expert to select what is needed for you.

When it comes to the selection of furniture and other fittings it is not such a difficult task, though here too you would be wise to call in an expert, probably your wife or your secretary. If left to your judgment you probably would select furniture as to its quality of resisting the effect of cigar ashes and grease rather than downright comfort. Women like comfort, beauty, harmony of color, pleasing contrasts and arrangements of details. If your competitor down the road supplies these essentials to a woman's nature and your room, though just as complete, lacks them, it is doubtful if all the prompt service in the world will make up for it.

Make a dicker with the local florist to send a few flowers every once in a while —a bowl of roses, a bunch of violets, a few carnations—not many so that it would be a heavy expense but just enough to give an air of refinement to the room and a touch of fragrance to the atmosphere. Nothing will make a bigger hit with your feminine patrons. A pot of spring bulbs—hyacinths or jonquils at this time of year is just the thing and they last a long time. Don't bother with artificial flowers—they brand the place as a show from the start, they catch dirt and dust and defeat the purpose for which they were intended.

Have a reliable woman come in and dust and clean up the place every morning. Clean the rugs once a week and in a general way look after the place just as your wife looks after her living room.

Above all if you are going to have a woman's room make it worth while. Not necessarily expensive and luxurious beyond its surroundings but at all times keep the woman in mind. Make it the way she would like it rather than the way you think she would like it if she thinks the way you do. Put it down as a fact that she doesn't think the way you do and plan some way to discover the way she does think. Your ability as a detective or investigator will measure your success.



If your rest room is attractive enough and pleasant enough, you will find your customer asking her friend to meet her there for a chat while some irregularity of her car is being attended to. If the friend drives a car and needs some accessory she is liable to think of it during the leisure afforded by her stay. She may even buy a tire or something of importance

The Oats in the Carbureter

Equipping a Service Car for Trouble in the Field. What Service Work Should be on the Road and What Should be Brought in

"THE oats in the carbureter" is not a name of any disease that is peculiar to the motor car or the truck, or the tractor either for that matter, but it is highly descriptive anyway for it typifies a particular kind of brand of trouble that is prevalent during the touring season, and the average motorist is hard put to it when beset with such trouble.

Some little trouble like a fleck of dirt on the breaker points, not discernible under close scrutiny, but still sufficiently large to prevent contact of the points is apt to baffle even the experienced motorist, and when presented with such a problem, forty miles from the last place, there is only one thing that a motorist, in such a predicament can do, and that is to put in a call to the dealer in the town from the nearest farm house.

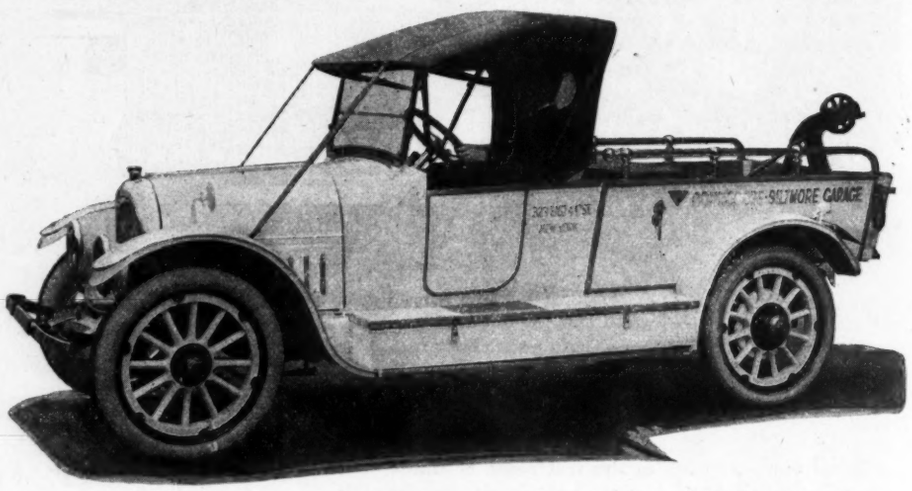
A farmer, with a tractor stalled in his field, because of some little trouble that he can not successfully solve, and the field half plowed, needs some service, and that in a hurry. There is only one way to reach this man and that is to have a portable rig fitted with the necessary tools for making quick repairs. The same condition is likely to occur when dealing with farm lights. There must be some one in the town that the farmer can rely on should any of his modernized power farm equipment go wrong.

Service of Two Forms

This service business must resolve itself into two forms. One for repairing done on the job and the other, repairing done in the dealers' service station. The service rendered on the job must be as complete as it is possible to give. But its completeness is not the essential requirement. Time is. Therefore some light rig is the preferable transportation medium. A motorcycle outfit or some light converted car seems to be the most logical way to solve this problem.

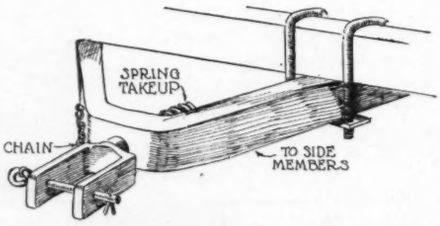
After deciding on the outfit, whether it will be a motorcycle or a light car, or preferably both, the next step is to fit it out with the proper tools so that if necessary the "oats in the carbureter" can be removed without making an unnecessary trip back to town for more tools. The idea is that this light rig must be complete for service work rendered in the field. Of course there are times when a motorcycle outfit will be called on to render service beyond its scope. That is the work might be too heavy for the motorcycle.

Replacing a clutch in a tractor right out in the field, as is being done with one popular little tractor, is a task that calls for more complete equipment than a motorcycle can carry and in this case the truck had better be sent to the job. After all, the work will be done by the smaller unit, for with this small sized service outfit, it will not be possible to bring back to the shop any sizable units such as a transmission or an engine. This is distinctly the field of the truck.



A neat service truck sent out by the Commodore hotel in New York. It is equipped with a portable crane and winch which enables it to pull a car out of any predicament

A side-car attachment fitted with a tool-box similar to the outfits used a good deal by telephone repair men can very easily be made by the dealer. The tools that are carried such as screwdrivers, pliers, a complete set of open end wrenches, monkey-wrenches, hammer, chisels, electric wiring both for high and low tension work, platinum points for the particular magnetos and electrical systems that he is handling, spark plugs, a small blow torch perhaps with a soldering iron for soldering up a broken gas line, gasket springs and other miscellaneous articles that experience proves as necessary when making minor repairs.



An easily made "draw bar" hook. The main section can be bent up after heating, and the link set in as shown with a sufficiently heavy spring behind it to absorb the direct shock of a sudden start

Just how to go in equipping the truck is rather difficult to say. There is much variance of opinion on this subject, too. One dealer we have in mind will not do any work on a transmission of the tractor he handles unless he is permitted to bring it in to his shop. To do this he sometimes sends out his regular service truck and loads the tractor on it and brings the whole outfit back to his shop.

Whether this is the wisest policy is rather hard to say, but it seems that a definite limit should be established at some place.

Equipment is the factor that determines just where this limit should be established. For instance, it was formerly thought that repairing a job where a bearing was burned out, could be handled only by bringing the machine or at least the engine back to the shop. Now though we find that improved equipment makes it possible to go right out in the field and repair a burned out connecting rod. Reaming out a badly scored cylinder can easily be accomplished with form of boring outfit, and it is not necessary to bring the engine into the shop either.

Consider the Tools Needed

So, when fitting out this service truck, be governed by the tools that you are going to equip it with. If a call comes in for help, on a tractor say, where the engine after boiling for some time started to squeak and then finally stopped altogether, it is either a question of no water or no oil. The results are probably serious.

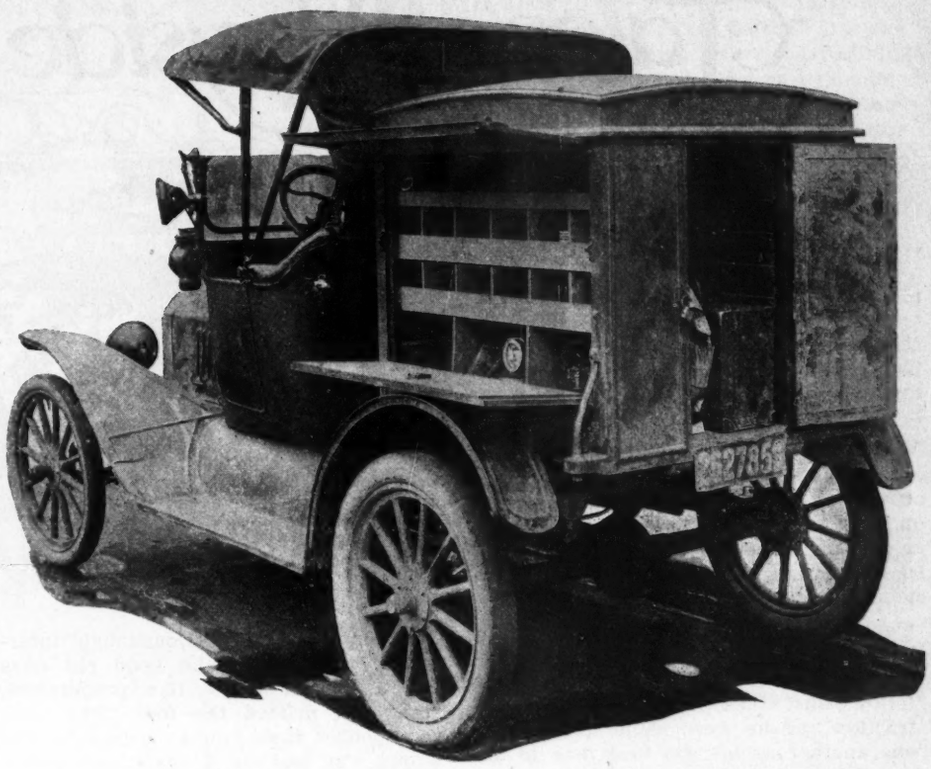
The light service car or the motorcycle outfit probably are not needed in this case at all. It will undoubtedly be a complete overhaul job. The bearings will probably be loose due to excessive heating, the cylinders might be scored from a loose wrist pin or a ring that broke from the extreme heat, the pistons are probably seized and there are a number

of things probably wrong which will need some attention before the engine can be run again. This work can be done in the service station with much greater ease than if attempted out on the job.

A motorist might call up from some place out in the country a short space. His tires have been giving unheard of service. Something like seven casings have gone within the last fifty miles. This fellow needs a vulcanizing job done in a hurry and probably a few new tubes. To send the light truck out to this man would be a waste of time and uncalled for. This is the ideal place for the motorcycle service to fit in.

Portable Crane Efficient

A portable crane on the service truck proves an efficient device. With it an engine can be lifted for placement in the frame. A transmission can be held suspended while swinging it to right position. Any man knows what a difficult job it is to swing a transmission into place and hold it there while securing it with the bolts in the housing. But if a line can be wrapped around it, to hold it in place, it is a simple matter to set the bolts.



An interesting development in service work is seen in this Ford car. The outfit is for farm light service only. It carries all small parts and with them the service man is able to take care of any trouble that may happen

Service Work You Don't Get

(*Continued from page 18*)

inclined to do too much of the work on their car. This is something that at first you may think you have no control over. But if your salesman, who sold the car knows his business the car owner should be sold on the idea of letting you do the important service work.

Of course there are many motorists who like to tinker with their car just to find out something about its construction. The motor car fan who spends his Sunday forenoons in the garage, rather than in church, does so because there is a peculiar fascination about the repairman's trade, that delights him. This man would rather clean out the carbon himself and blow all the carbon particles out through the intake valve passage, just because he takes pride in his ability as a tinkerer.

But when the car is running again and all the little carbon particles have stuck on the valve seat, he begins to think that after all it would have been better for him to have the work done by someone who knows. The result is that he is forced to bring the car in, and the probability is that the car is in worse shape than it was before the tinkering started.

Why not have your salesman convince the man of this before he has had to go through a lot of trouble to find it out for himself?

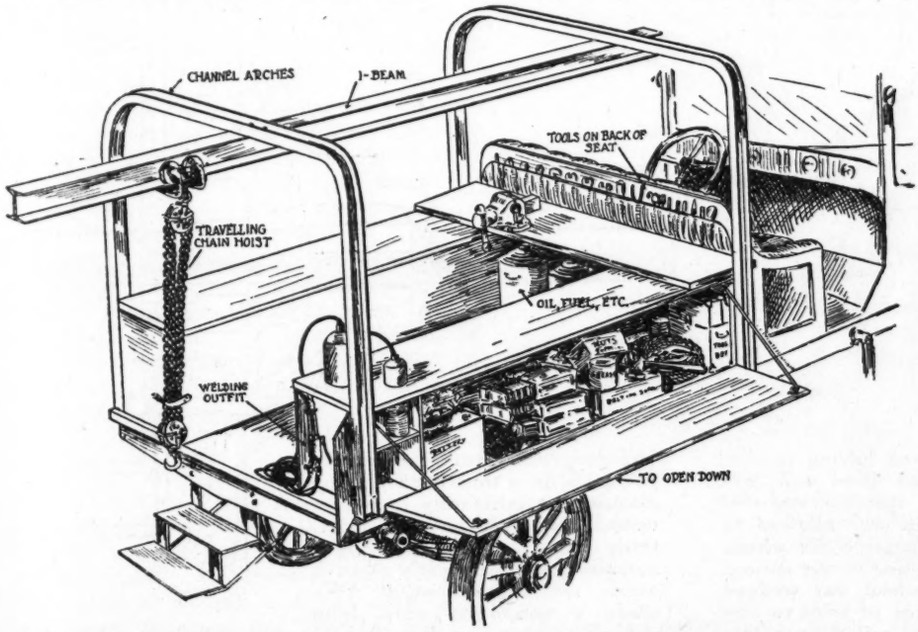
Some Things the Owner Can Do

Of course there are a number of things that the average owner will always do. Such tasks as cleaning the spark plugs, lubricating all the different parts, adding water to the storage battery, cleansing out the crankcase, cleaning the radiator and tightening the fan belt. But when tasks involving more complex treatment are attempted, disastrous results generally follow because the owner finds himself with a few parts left over for which he can find no use.

It is very doubtful whether it is a good policy for the average car owner to adjust his rear axle, yet many of them do so, observing all the necessary precautions, and obtaining a satisfactory job. We have heard and know a goodly number of car owners who have attempted jobs of a similar nature on their cars, but without success, for they have been heard to exclaim before the task was completed, "Had I known what I was tackling b fore I started this job, I certainly would never have gone into it."

The task of cleaning out the carbon is not exactly suited to the average car owner, because the carbon granules are apt to collect under the valve seat which destroys a good job of valve grinding.

The story of engine repair as told in the pictures is perhaps exaggerated largely, but there is some truth in it nevertheless



Rigging up a light truck with a complete repair outfit, so that work of any kind may be handled on tractors, trucks or cars that may be stalled calls for a comprehensive assortment. The above is a suggestion

Tales of Wayside Repairs

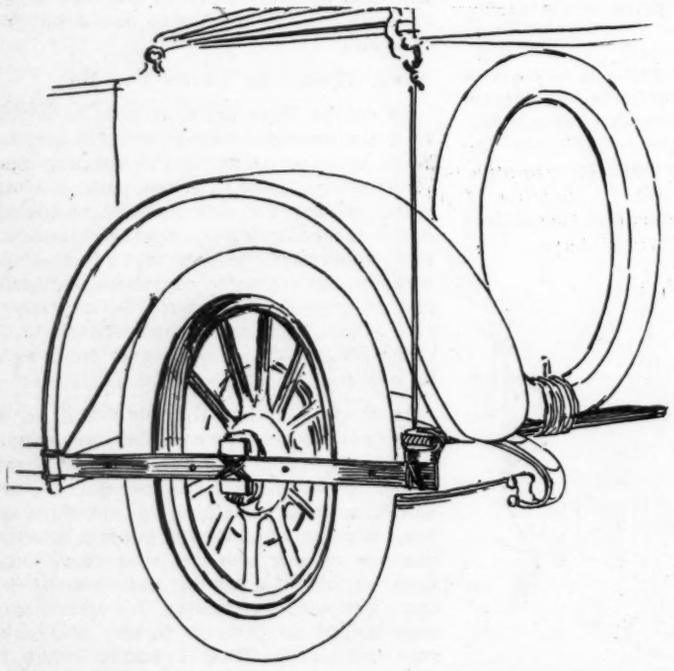
"SPEAKING of roadside repairs," said Bill Walton, veteran dealer in Rooterville, and organizer of the automobile trade association of that town, "reminds me of the time we went out about twenty-odd miles on the Threeforks road. It must have been about eleven years ago, because as I remember that road wasn't paved at the time, and that's what caused the trouble. This fellow was stuck in a mud hole, and traction and he were about as close to one another as his gas tank was to his gasoline."

"You see," went on Bill by way of explanation, "his gas tank was empty. They didn't use self starters in those days and this fellow had lost his crank. It wouldn't have been so bad if his dry batteries hadn't leaked dry."

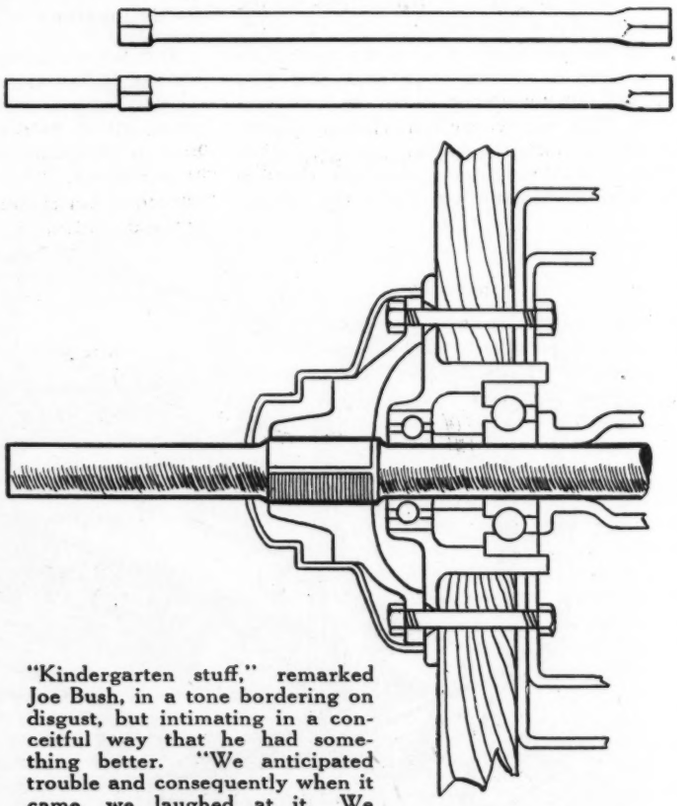
"I suppose," Mike Donahough interjected, thinking of the good old days and a fish of whale like proportions, "that you primed the fool thing with your pocket flask, rubbed a cat's fur the wrong way and got a spark and said a few magic words and got the thing loose."

"Well, no," Bill said by way of reply, "although it might be done at that. We didn't have your method in mind, Mike, but what we did was this: It happened I had my flashlight with me and the poor old stuck-in-the-mud had his. Well, we connected the ignition up with the batteries from the flashlights, and lined them up in series. In those days they used Prest-O-Lite tanks, so we hooked the Prest-O-tank up to the intake manifold and shut about half of the valves in the carbureter.

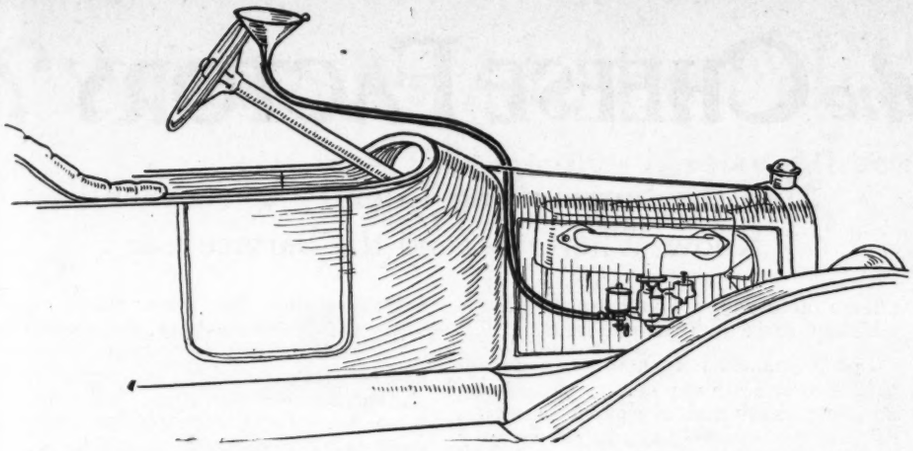
"It happened that I had a good block and tackle outfit and with this we got the car out of the mud hole, so all we had to do next was start the engine.



"After stewing around for about an hour and having smoked every cigar I had, I finally tore a signboard down and constructed a scaffold around the wheel. One member was tied across the rear of the springs, and enough was allowed to protrude so that a strip could be placed alongside the wheel, fastened to the outstanding end of the piece tied to the spring. The other end of the strip alongside the wheel was wedged under the running board and tied by a piece of wire to one of the fender bolts. Two small blocks were nailed over this wheel strip so that they formed an imitation hub cap. Then we smeared the whole thing with grease and drove to town."



"Kindergarten stuff," remarked Joe Bush, in a tone bordering on disgust, but intimating in a conceitful way that he had something better. "We anticipated trouble and consequently when it came, we laughed at it. We made a temporary axle, long enough to protrude through a temporary hub cap about 6 in. This gave ample room to use either a rope or a cable for a winch to pull the car forward or backward."



"Now we came across just such a case once only some fellow had bumped into his car from the rear end and in so doing pushed the bottom of his gas tank out. He managed to catch some of the gasoline in an old tin can. Well, all we did was to hook up a rubber tube to his carbureter and attach a funnel to the end of the tube. We taped the funnel to the steering column and the driver brought the car into our place pouring gas into the funnel as he drove."

Well, it's a simple enough matter to jack one rear wheel of a car up, slip the transmission in high and give the wheel a kick. The funny thing about the whole affair was the fellow kicked when I charged him $4.50. Wish I could do the same thing for some fellow now. I'd take a look at his pocketbook before I charged him."

The monthly meeting of the Rooterville Automobile Trade Association was in order. The dinner was over and a cloud of smoke started to gather.

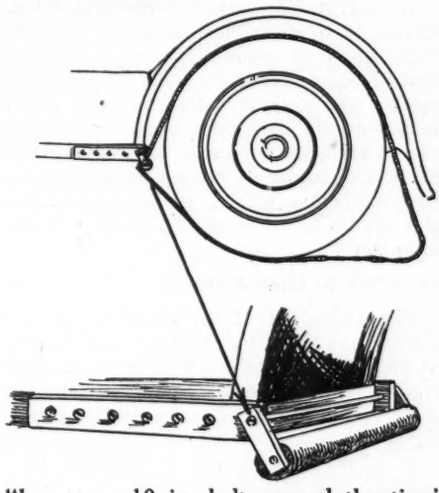
About this time Art Howe began to feel that it was high time for him to narrate on extrication, particularly as he had evolved a new method for securing traction.

Howe began, "the trouble with you fellows, is that you do everything after the trouble occurs, but you don't do a thing before that might prevent the trouble from happening. All my customers are buying the system I developed for getting added traction and enough added surface to prevent car from sinking down into the mud.

"I wrap a 10 in. belt around the tire," went on Howe, becoming specific, "making the belt long enough to go around the tire with about 5 or 6 ft. in length to spare. At the rear end of the running board we bolt on two pieces of strap iron, one on each side of the running board. Then we shackle a wooden roller to these strap iron bars and allow the belt to pass over the roller. Enough belt trails out to form a veritable crawler tread. And boy, you should see the muck I've plowed through with this arrangement.

"The belt is made of heavy fabric rubberized material, about ¼ in. thick. This is heavy enough to prevent the tires from breaking through the mire. For heavy going in sand I have never seen the equal of this scheme, and I've seen a good many schemes too!" Howe concluded forcibly.

Deacon Jones, termed so because of the ministerial atmosphere that constantly surrounded him thought that the opportune moment had arrived for him to spring a little stunt. His first thoughts on the subject made him shrink from announcing his scheme, because to his way of thinking there might be some questions as to the veracity of the statements made. But, now that others had ventured to the thin ice of doubt, he thought he could properly introduce his subject.



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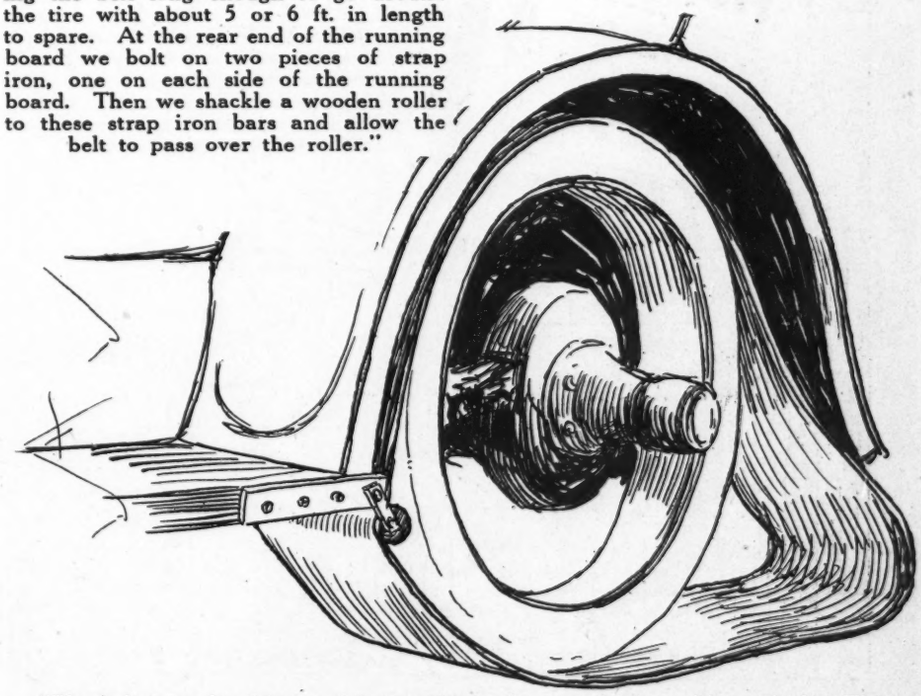
Deacon began, "carbureters don't always carburet, especially when the gas line is cracked and there ain't any fuel flowing to the mixer. Now we came across just such a case once, only some fellow had bumped into his car from the rear end and in so doing pushed the bottom of his gas tank out. He managed to catch some of the gasoline in an old tin can. Well, all we did was to hook up a rubber tube to his carbureter and attach a funnel to the end of the tube. We taped the funnel to the steering column and the driver brought the car into our place pouring gas into the funnel as he drove."

"Yes, it might be so," Dave Jenkins informed the crowd authoritatively, "but if you believe Deacon's story, you ought to believe mine.

"We were out west one year, the wife and I vacationing in one of the early models. The scenery at the particular place where the plot is laid was especially beautiful. I remember a waterfall that one viewed from this road. The water poured out from the mountain side in a thin silvery white steam, and the sunlight was reflected in the falling waters as if thousands of jewels were rush-

(*Continued on page* 40)



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WHERE *is the* CHEESE FACTORY?

Map the Surrounding Country so You Will Know Where to Send the Service Car

SUPPOSING some one called you on the phone and said, "I'm out of gas, located here by the cheese factory. Can you send a man out to fix me up?"

If you knew the surrounding territory so well that you would not have to pause and cudgel your brain during the interval devoted to silent thought, thinking the while of the location of the cheese factory, you would reply, "Have a man out there in twenty minutes."

But if you did not know the exact location of the cheese factory you would no doubt cause him to wonder why it is that the dealer who placards the country side for miles around with announcements of his ability to give genuine service, is not sufficiently well versed with the country side to know where such prominent locations as the cheese factory, for example, are.

A very simple way to remedy this condition, is to distribute to every motorist that stops at your place of business a little folder showing a map of your territory for several miles around zoned into sections with your establishment as the center of the map. The illustration of such a folder is shown in the accompanying columns. A little folder like this would be of inestimable value to the motorist.

Give One to Each Motorist

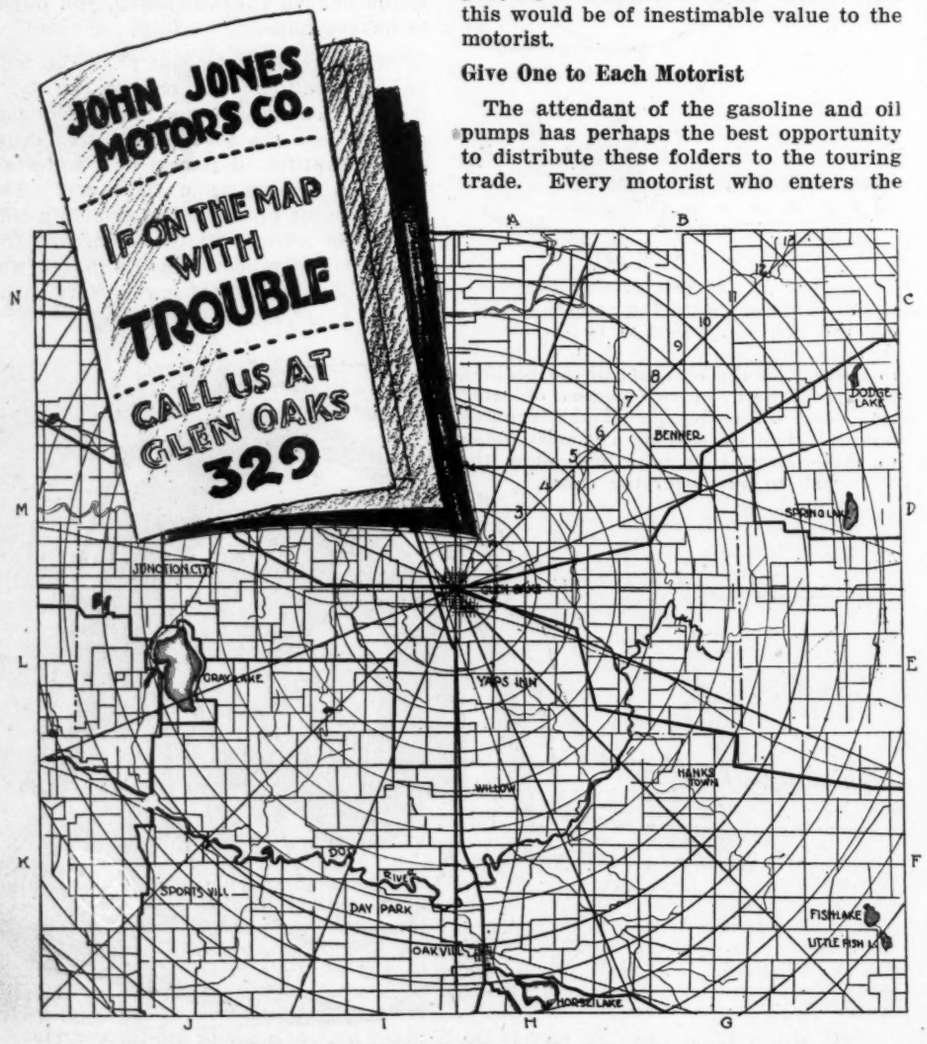
The attendant of the gasoline and oil pumps has perhaps the best opportunity to distribute these folders to the touring trade. Every motorist who enters the service station for some slight repair must upon leaving pass out closely to the gasoline dispensing pumps, for these are generally located near the drive in and drive out entrance. Handing the folder to the driver of the car while his gasoline tank is being filled with a few explanatory words that he is at that moment at the center of the map, and all roads leading out of town within a radius of 20 to 25 miles are shown, also that the establishment is prepared to reach him should he have any unfortunate trouble while still within the bounds as shown on the map.

How to Make the Map

There are any number of ways in which a map might be worked out so as to make it easy for one to locate his exact position and convey the information over the phone to the dealer in the nearest town. The method we have chosen seems to be as simple as any. The map is divided into sections or zones one mile apart. Then to give the necessary cross reference, the radial lines are drawn with the proper identification of each radial section designated as A, B, C, D, etc.

Now with such a map on hand, the dealer would probably have an inlarged view of the same map hanging on the wall in his office, it would be a simple matter to locate any of your customers should they call in from their stranded position.

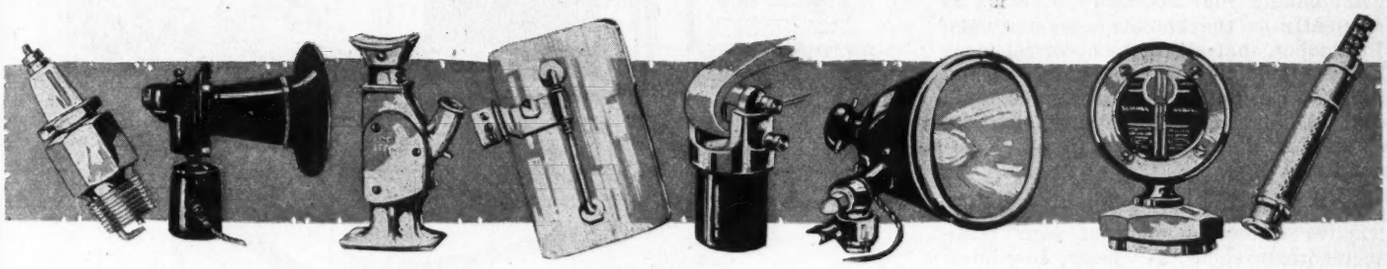
Supposing the telephone bell did ring, and the man at the other end of the wire informs you that according to the map you gave him earlier in the day, his latitude and longitude at that moment is on the main road from Glen Oaks, zone 11, and section C, and that unless you get out to fix a wheel for him, he will probably be there for several moments longer.



A folder to be distributed to the transient trade, showing a map of the surrounding country side, zoned and divided into sections so locations can be determined easily and without waste of time

Accessories Are Part of Your Service

Buy Intelligently—Display Attractively—Give Immediate Satisfactory Service



BY GEORGE R. VOLZ

THE summer season will bring a big increase in motor vehicle traffic and there will be a lot of overhauling and re-equipping of cars.

Accessories are a big feature of summer service.

What are you as a dealer going to handle?

How are you going to conduct your accessory business to obtain successful results?

Perhaps, first of all, the motorist needs new tires and if he is preparing for a trip he will want extras. This is the time to talk to him concerning tire carriers and trunk racks and impress upon him the necessity of tire covers for the protection of his spare tires. It is not until the dust begins to fly that the driver realizes the advantage and convenience of seat covers. Warm weather will bring with it the problem of proper cooling of the engine and, of course, the owner should be provided with a device for watching the temperature of the cooling system. How about the fan belts and hose connections to improve the cooling?

Money-Saving Accessories

With the great rush of traffic to the improved roads there arises the great chance of getting into a "smash up." The car owner may consider himself a very reliable and careful driver, but how about the other fellow? Why not put on bumpers to protect his car? Every car should be insured and insurance rates are greatly reduced if the car is equipped with suitable locking devices, so there is a chance to sell locks.

Most car owners take a great deal of pride in the appearance of their cars and are always on the alert for useful and decorative accessories. The spotlight, a great advantage in night driving can be used as a trouble lamp and is ornamental. Glass wings are not only very effective in deflecting the air currents but add a bit of refinement to the car as well.

The things mentioned are large accessories and of the type that will give you a chance to make the installation as well as sell the product. There are however, many smaller things that you will have to carry and when properly handled will prove of great promise. Somebody is always losing a pair of pliers, forgetting his air gage, having a cracked or broken spark plug, breaking a fan belt, burning out headlight bulbs or doing something that creates a necessity for small accessories of this kind.

Accessories to Handle

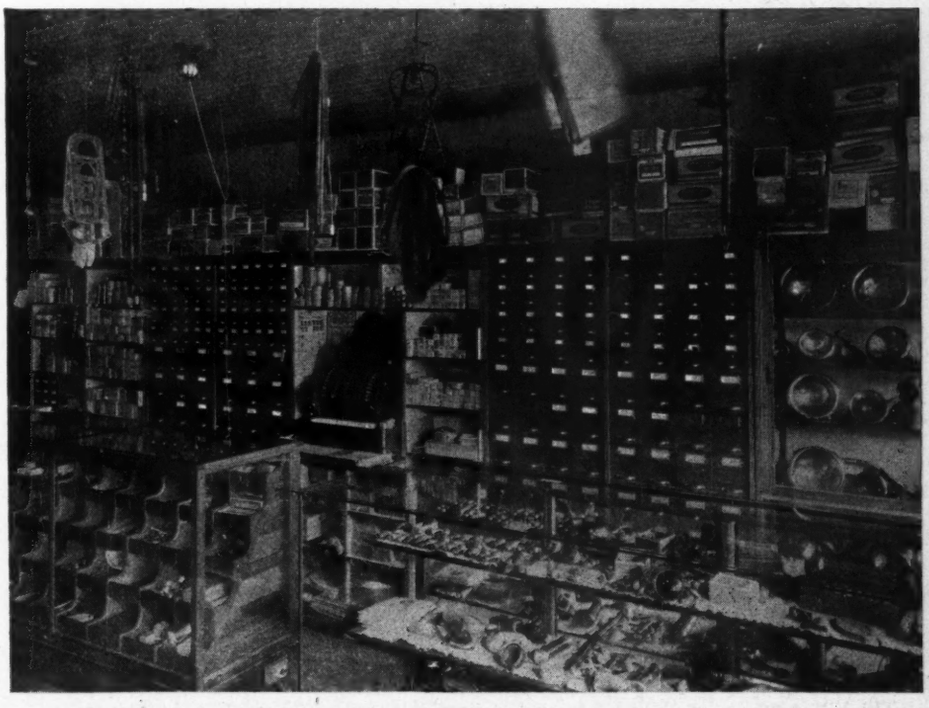
Tires & Covers	Tape
Tire Racks	Valve Cores
Bumpers	Chains
Spotlights	Jacks
Locks	Wrenches
Spark Plugs	Vulcanizers
Flashlights	Blowout Patches
Cotterpins	Tire Patches
Tire Gages	Fibre Mats
Fuses	Hose Clamps
Tubes	Sponges
Luggage Racks	Chamois Skins
Seat Covers	Polishes
Glass Wings	Gloves
Horns	Goggles
Bulbs	Moto-meters
Pliers	Clocks

Know Your Customers

The purchase of accessories means quite a lay out of money to the owner of a small service station and this involves two very important business principles. Good buying and successful selling.

In the first place, the dealer must know the proportion of different makes of cars in his territory, and because of the fact that all accessories are not universal, he must make his purchases suitable; first to his trade and second to the volume of business obtained from tourists.

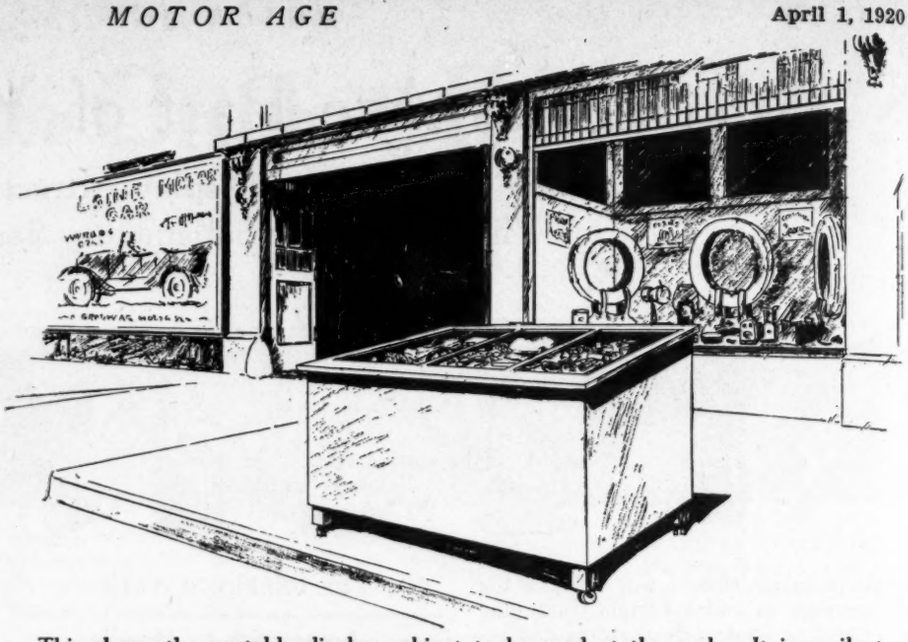
One of the fundamentals of successful



This shows how one dealer arranged his accessory room making use of sectional cabinets that can be added to if business warrants

selling is proper display combined with a clean cut, neat and systematic arrangement of the products to be sold. No product can be sold by placing it in the storeroom upstairs, or in a dark corner of your service station where none can see it. Get it out where the motorist will see it. Don't think, just because you are located in a small town you can't handle your accessory business as efficiently as the big town service man. Remember, that all of the cleverest ideas are not exhibited in the big towns and that you can put spice into your business that will attract the attention of tourists as well as the car owners in your community.

A good suggestion is to make an attractive window display of your large accessories such as jacks, tow-lines, tires, tire carriers, luggage racks, bumpers, seat covers, spotlights, flashlights, horns and glass wings. This will serve as a silent salesman and the man who drives up to your curb for gasoline or oil will be confronted with something to remind him of what he needs.



This shows the portable display cabinet to be used at the curb. It is a silent and efficient salesman and also provides a means of keeping the tools together that are used by the mechanics making adjustments at the curb

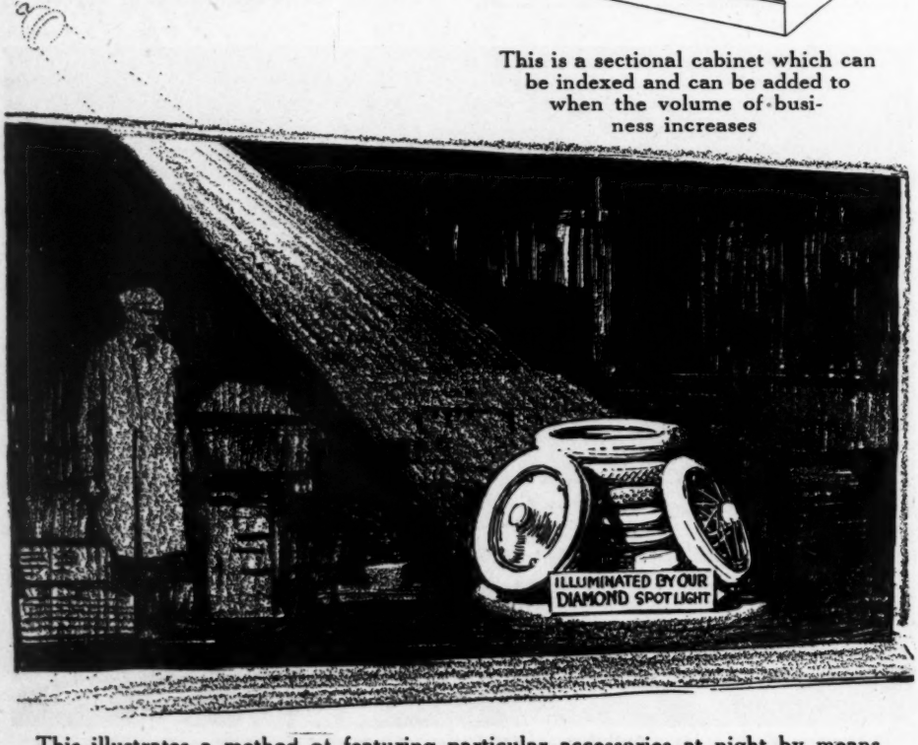
Portable Service Case

Another form of silent efficient salesman is the portable service case such as is illustrated. This is to be used at the curb and will save many a trip inside. The case is arranged so as to bring the needed accessories right up to the motorist as well as to bring needed tools and supplies to the mechanic at work at the curb when some minor adjustment or repair is involved.

The case is made with an inclined top that is covered with glass. This is so the contents can be easily seen from within the car. Under the top tray, which contains the small accessories, is a tray in which the mechanic's tools are to be kept. Along with the tools are provided grease, rags, etc., all of ready service to the workman and of ultimate service to the customer in the time saved.

This is a sectional cabinet which can be indexed and can be added to when the volume of business increases

At night it is a good plan to feature a few pieces of equipment. Keep the display room dark and attach a few spotlights, that can be made to work intermittently, above the window. This will enable you to throw a beam of light on a particular object, make it loom up and catch the eye of the people passing by. Most people will have to admit that although they may not need a certain article yet when they see it attractively displayed there is created a great desire to purchase it and this is one of the things that builds up the selling business.



This illustrates a method of featuring particular accessories at night by means of a spot light. It will attract the attention of people passing the display window

Add Stock As Business Increases

It may be that you can't afford to start out on a large scale but there is nothing to prevent you from starting out with a clean cut, attractive layout and preparing for a bigger volume of business. One of the illustrations shows an interior arrangement for accessories which has as its basis sectional cabinets that can be added to as business warrants it.

Give satisfaction. Don't try to sell a man something he don't want just because it is part of your stock that you want to get rid of. Sell him something that he wants and that will be serviceable to him. A pleased customer is a lasting friend and satisfaction will bring him back to do more business.

In your accessory business remember these things:

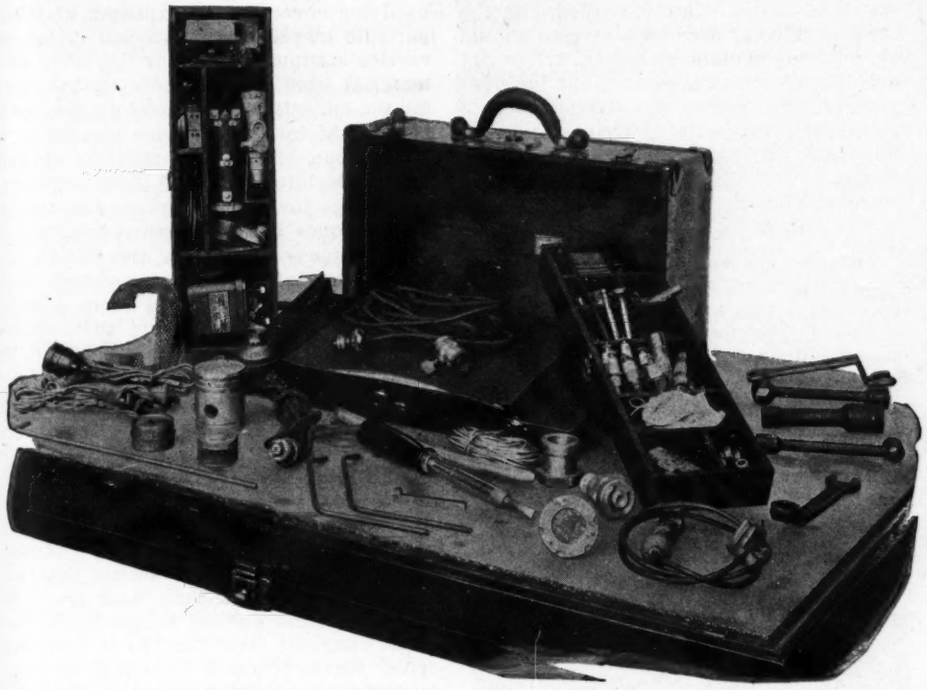
Buy intelligently.

Display attractively.

Give immediate, satisfactory service.

Servicing the Farm Light

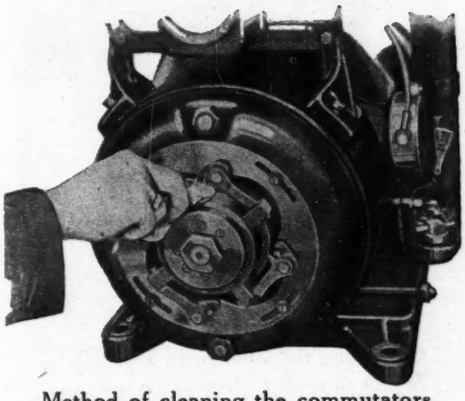
Properly Educated Farm Light Owners Means Less Calls for Service and More Satisfied Boosters of the Product



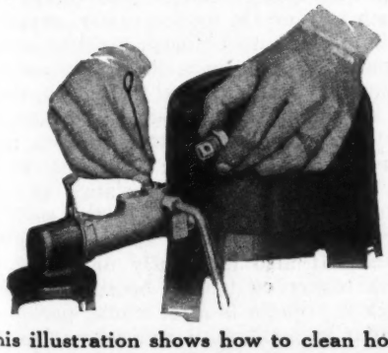
This is a representative service kit, that contains all the necessary tools and testing equipment for farm lighting plants

SERVICING the farm-light divides into two sections in which four principles are involved, the manufacturer, the distributor and the dealer in one, and the owner in the other.

There are two kinds of farm-lighting outfits used, the automatic control system and the battery system. Although the farm-lighting plants are virtually trouble-proof, troubles are likely to occur such as engine, generator, control or wiring with the automatic control system, and engine, generator, control, battery or wiring with the battery system. This shows that at least three quarters of the possible troubles are apt to be electrical. The dealer and service station mechanic are familiar with the automobile and tractor engine and can analyze engine troubles quicker, but can they analyze electrical troubles quickly and make the necessary repairs? How can they obtain this information?



Method of cleaning the commutators explained by photograph



This illustration shows how to clean holes in the mixing valve body

Some manufacturers have adopted the plan of conducting service conventions, the purpose of which is to acquaint the distributor and service man with the construction and operation of the farm-lighting plants. Lectures on the construction and operation are given as well as practical tests, demonstrations, and discussions of various troubles that might occur.

Distributors Educate Dealers

After this information is given to the distributors it is up to them to see that their dealers are properly educated in the ways of successful service. The manufacturers also issue books of instruction for installation and maintenance, and should the dealer find they have not sufficient information, it is his business to supplement the instructions.

Oftentimes a dealer does not receive much support from the distributor and finds that the factory service men cannot cover his territory often enough. He is then left to organize a service system of his own as he absolutely must service the product he sells. After the outfit is sold it is a good idea to go out to the farm, spend considerable time explaining its construction and operation, and give some good instructions on its upkeep.

Instruct the Owner

Starting the owner out with the proper methods of upkeep before him and a thorough understanding of what to do to remedy certain minor troubles will save a great many unnecessary trips to fix the outfit. See that a set of instructions with diagrams and illustrations of actual operations are placed right near the machine where he can always see them. After a week or so take a run out and see how the outfit is working and find out if the owner understands how to do certain things such as testing the battery, filling the cells with water, and putting oil in the crankcase?

A good scheme is to send out follow up letters containing questions that can be answered by either yes or no such as:

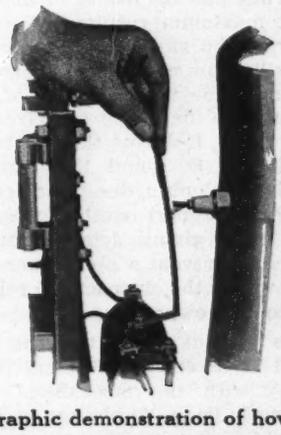
Do you know how to clean the fuel hole in the mixing valve?

Do you know how to test the battery and fill the cells with water?

Do you know how to clean the commutator?

Make a request to return the letter with the answers which will enable you to tell what owners understand their outfits, and will give you a chance to send

(*Continued on page 61*)



Photographic demonstration of how to test the spark

Servicing the Motor Truck

Often Necessary to Keep Night Force Working in Order That Trucks Can Be Used Next Day for Usual Purposes

MOTOR trucks in order to function properly must be kept running. Unlike the passenger car the motor truck must run day in and day out, if it is to serve the useful purpose for which it has been designed, built and sold. The reason trucks are bought is because more material can be carried in a given space of time and more economically, other things being equal.

The servicing of commercial vehicles is therefore, just as important, if not more so, than that of passenger cars. With a passenger car owner it does not matter a great deal whether or not he is deprived several hours or several days of the use of his car, but where a fleet of trucks, or even one truck, is operated by a concern, it becomes very essential that those vehicles remain in service every working day.

From the mere fact that trucks are in use for the greater part of every day, it at once becomes evident that much of motor truck service work must be done at night. When this is done the truck is ready for work the next morning, unless the job is one that requires more time. Many dealers who are servicing both cars and trucks do not give night service work on passenger cars, but do so on trucks, for the reason cited above.

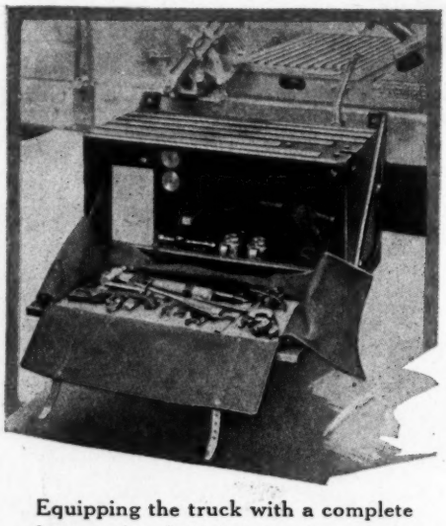
Trucks Are An Investment

A truck continually laid up for repairs is a poor investment. This might be due to an inherent defect in the truck or to lack of proper attention. Proper inspection at regular intervals will keep a truck in condition and reduce repair costs to a minimum. Dealers who are using the periodic system of truck inspection are staving off much unnecessary service work and boosting their business from the fact that the trucks are kept going.

To carry out a system of periodic inspection some predetermined plan must be thought out, so that both the owner of the truck and the dealer or distributor will get maximum results. Then, some form or record sheet must be developed which will show not only the mechanical condition of the truck, but be of educational value to the owner or driver of the vehicle. Thus, if during the course of the inspection, it is found that something serious is developing, due to neglect, then the inspection report can be accompanied with a letter giving detail information as to how to prevent a recurrence of this trouble when the inspection report is mailed to the owner.

It goes without saying that the inspector must be a competent man, familiar especially with the mechanical details of the truck he is servicing, as it then is possible very often for the inspector to tell merely from the general looks or sound of things what is needed. At the time of delivery a competent man should be sent out explaining to the driver not only the mechanical details, but the dangers of overloading and overspeeding a new truck, necessity of frequent changing of the oil in the engine, chassis lubrication and similar things. Stress must be placed on the peculiar characteristics of the truck.

The first inspection of a new truck is a very important one. If the inspector is on to his job he will be able to tell exactly how thoroughly the driver has exactlowed out the preliminary instructions in the care of the truck. This is an important bit of information for the dealer as the latter can then tell the owner of the truck about the qualifications of the driver. Every dealer wants his trucks to give satisfaction, but a big harm can be done his business through the careless handling of the product by inferior drivers.



Equipping the truck with a complete layout of tools and spares is one way of keeping down service costs. A complete tool equipment is an incentive for the driver to care for the truck

The advantage of regular inspections lies in the fact that often a large repair bill is avoided by catching a fault before it really becomes serious. The printed forms used for the inspection should have enough space at the bottom to permit the inspector to make a statement regarding the general condition of the truck, especially the lubrication it has received and also any suggestions that may be beneficial to the concern or individual operating the truck. Also reports should be made out in duplicate, one to be mailed to the owner and the other to be rtained for the dealer's file.

Naturally there must be some means used for covering the expenses of these periodic inspections. In some instances service stations charge for the labor and material used, while others charge only for the material used, providing the truck is brought into the service station at a stated time. Some dealers have worked out a schedule and zoned their territory, the charge for the inspections increasing as the zones become farther away from the service station. In the latter instance, the material used, inspector's time and transportation to and from a zone must be considered. From the experience of previous inspections it would be possible to work out and adopt a standardized inspection charge for each zone.

While it is an excellent plant to instruct the driver in the why's and wherefore's of the truck, don't overdo it, otherwise he might become inclined to constantly tinker with the truck just to see what makes the wheels go 'round. Avoid both extremes. If after seeing that all nuts and bolts are tight and there is water, gasoline and oil in the truck the truck runs all right, see to it that the driver leaves it alone. Leave it to your inspector to pass judgment on the conditions of any of the units.

Proper Tools Reduce Service Costs

The manufacturer can do much good towards getting the driver to care for his truck if he provides plenty of tools and spares in the equipment that goes with the truck. If he leaves out special wrenches that might make a certain adjustment easier, he is inviting trouble, because when you make it hard for a man to do a certain thing, the man is pretty sure not to do it. If your instruction book mentions a certain nut to turn, but you have not the wrench to get at it, it probably will not be turned, excepting at the service station. So, equipping the truck with a complete layout of tools and spares as shown on this page is one way of keeping down service costs.

Regarding the servicing of trucks and passenger cars together, it seems from expressions by dealers that where the truck is over 1½ tons capacity, separate buildings should be used, brought about, usually, by the space item. Unless the service station is very large and there is a comparatively small amount of servicing done at one time in both passenger car and truck divisions there is bound to be overcrowding to the detriment of the passenger car service, because trucks take up much more space. It also is usually necessary to work longer on trucks, because when a truck is brought in after a long period of regular inspections, it generally means a complete overhauling.

KEEPING THE TRACTOR FIT

Distribution of Repair Parts Main Point to Consider In Service To Tractor Owner

BY FRED M. LOOMIS

THE servicing of tractors does not call for extraordinary efforts on the part of the dealer, as many who are not at present handling tractors are wont to believe. We long are past the point where we look to the factory to send out experts on tractor service, and tractor service like motor car service must come from the dealer.

But, the farmer who buys the tractor can be made his own service man if the dealer uses the right methods. In the first place, tractor service, speaking not of actual mechanical operations involved in the work, is unlike any other kind of service. The farmer cannot limp to town with his tractor like the motor car owner might do with his car. Service has to be taken out to the farmer instead of he coming to a service station for it.

Then there is another point. Many car owners drive to a service station because they often can leave their cars while attending to other matters. It is not always an inconvenience to a car owner to be without the use of his car for a time, but to be deprived of the use of his tractor for any length of time to the farmer would often amount to nothing short of a calamity.

Farmer Has Advantage

Probably if car owners were dressed in overalls all the time they are driving their cars they would look after the car more properly. They would not mind so much reaching underneath the body to turn up a few grease cups, or to get underneath the engine and tighten the cap screws in the crankcase. The man who operates a tractor is of necessity dressed so that he does not mind getting out to clean the plows or crawl under the tractor and make adjustments or repairs.

The thought is simply this: The farmer is potentially in a better position to take care of a tractor than the motor car owner is to take care of his car. Besides, the farmer, as a rule, is more used to machinery than the average car owner and service and repair work thus comes easier to him.

Of course, there are some things the farmer hardly can do on the tractor. Certain adjustments or repairs must be done by experts. Such jobs as installing a new crankshaft, new bearings, cylinder and piston work, timing the engine and magneto work are jobs that require considerable experience and it is better for the dealer's service man to tackle such work. Practically all other jobs can be done by the farmer, including the replacing of worn parts.

Every farmer can be his own service man to a large extent and do most anything except bearing and magneto work. A job of adjusting the connecting rod bearings, as shown above, is really a job for the expert, but with care the farmer can do a good job, especially if he studies his instruction book

If a part has to be machined the farmer can take it to the nearest machine shop, whether such a shop is directly connected with the tractor business or not. The farmer generally knows just what he wants done with the piece and it is only a job of grinding, drilling or turning in a lathe. He is used to having work done on his motor car, cream separator, thresher, etc., and so it will not be anything new to him to look after the maintenance of his tractor.

Tractor service differs vastly from any other kind of automotive service. When tractors are working they are making money for the farmer and breakdowns become serious matters at certain periods of the year. But the farmer cannot limp to town with the tractor for service. Service must be taken out to him. As certain times of the year most every tractor is working and then it is that the dealer must be on the lookout to see that his service department is on the alert.

Of course, the dealer who sold the tractor to the farmer must not trust entirely to the latter's ability, because just how well tractors are kept in operating condition in the dealer's territory, so will his future sales be determined. Farmers have a way of visiting with one another and if some of them are using the same make of tractor from which they are getting good results and good cooperation on the part of the man that sold them, you can rest assured that the rest of the community is going to know about it.

And so while it is all right to let the farmer go ahead and do most of the service and repair jobs by himself, a good plan for the dealer to follow is to send his service man out at certain intervals to check up things a little. Often a 10 minute visit of the service man will stave off a $50 repair bill and dissatisfaction of the farmer.

Gaining the Farmers Confidence

These little visits cost very little, but they prove to the farmer that the dealer has not lost interest in him after the goods have been sold and delivered. Properly educating the farmer as to how he can get the most out of his machine is a real service that usually requires no cash outlay. There always are prospect in a neighborhood where the dealer already has sold a few tractors, but these potential buyers easily can be lost if the machines already in use are out of commission for a time owing to unintentional neglect or ignorance on the part of the farmer when it could have been avoided by the dealer.

Repair parts distribution are one of the biggest things that the dealer must watch in his tractor service. To tie up a tractor during the plowing season for want of a repair part is tragic. The farmer should have on hand certain replacement parts that experience has shown are the most apt to be needed. Most farmers have on hand screws, bolts, links for their binder chains, sections for the sickle, etc., but it is relatively more important for them to stock up with trac-

(Continued on page 81)

EDITORIAL

Make Service Fit Conditions

ALTHOUGH the modern motor car has become an all-year proposition and there is less laying-up of cars during the winter months, the fact still remains that the summer months are the ones to tax the capacity of every service station. Summer service does not involve so much the question of getting the service station full of work as it does taking care of the great amount of work incident to warm weather driving.

TO add to great number of cars released in summer the dealer has the tractors to consider and also the motor trucks. Trucks must be kept in commission during the whole year and service does not peak quite as heavily on them as on motor cars and tractors. Exceptions to this might, however, be found in the farm trucks, especially in regions where heavy snows abound for a long time each year.

WE have then, the question of properly taking care of service on the number of automotive vehicles already running and must add to this number the new cars, trucks and tractors which our factories are turning out every day. While new vehicles do not call for anything like overhauls, etc., still they must receive necessary attention from the dealer's service station. The product must be kept sold and the surest way of doing this is to let the new owners see that you are interested in them. Similarly the old customers must be made to feel that you don't want to let go of them.

PROPERLY handling the great amount of summer service might mean an addition to the dealer's present building. He might install more machinery to supplement present conditions. One good plan is to check over your present layout and see if there cannot be a better adaptation of the space available to conditions. Often a large building is found to be uneconomically divided, so that space is wasted. More intensive service must be had from smaller buildings. This can be accomplished to a large extent by sizing up your future sales possibilities and then tooling up for it.

Service the Machine You Sell

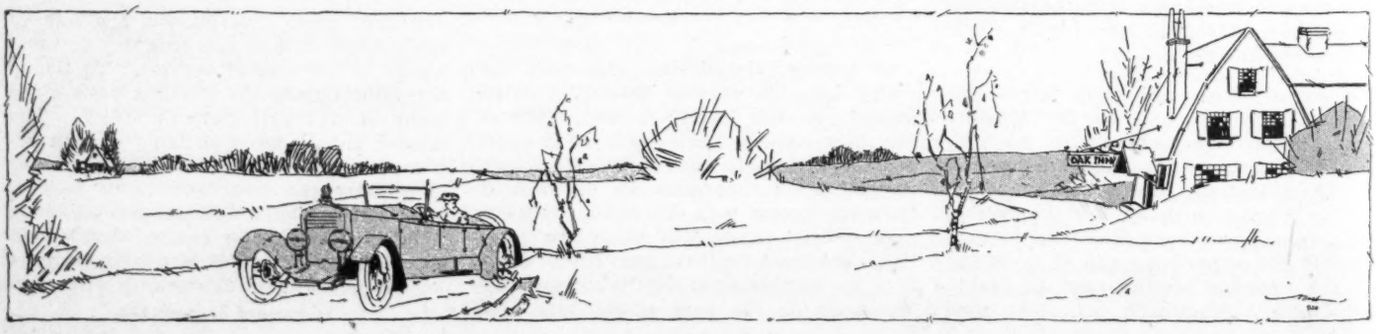
THE man who purchases a machine from a dealer has a right to expect that, when he needs service, he will get it; and further, that he will rank in preference to the man who owns a car, foreign to the make handled by the dealer. In other words, the dealer's customers first, and it is questionable whether a service policy should include other makes of machines, at all.

AN interesting story was heard the other day of a dealer and a close personal friend of the dealer. The dealer's friend owned a car different from the make the dealer handled. One day the owner drove up to his friend's service station and asked to have a small noise in the transmission investigated and repaired.

WITHOUT a moment's hesitation the dealer replied saying that he didn't think it would be fair to take the car into his shop, because his men were not at all familiar with the car, and in all probability, the bill would be three or four times as high as it would be if dealer so and so, over in the next town, who handled that make of car, did the work. The dealer further explained that his parts were limited to but one make of car and should it be necessary to install new parts after the transmission was disassembled the factory would have to be summoned to the rescue, all occasioning a long delay. The owner was satisfied and took his car to the man that sold that make.

THE dealer's explanation, though apparently satisfactory, gave only one side of the question. The real facts of the situation concerned the dealer's customers. He reasoned that even though his place of business was not rushed at the time, still, if it should happen that two or three of his customers suddenly came in, he wanted his force to be ready and available for the customer's benefit.

THIS particular dealer makes it a point to sell his cars through his service. His sales are enormous. And the way it works out is as follows: John Jones buys a car of this dealer. The dealer makes it his business to see that Jones' car keeps running. The result is obvious. Jones tells his friend Smith that his car hasn't lost a day in a year, because of the efficient service his dealer sells him; so Smith decides that that car, together with the service, ought to make a pretty good combination and he buys one too.



Tommy Milton is Winner at Los Angeles

LOS ANGELES, Calif., March 28—Tommy Milton won the speedway championship on the mile and a quarter oval at Beverly Hills this afternoon from a field of fourteen of the best drivers and fastest cars in the country. He drove 50 miles at a speed of 111.8 m.p.h. Art Klein finished second, Eddie Pullen, third, and Roscoe Sarles, fourth.

It was not by driving 50 miles only that Milton won his honor and a liberal slice of the $15,000 purse. He had to participate in a previous heat of the same distance and be among the first four to finish in order to get a crack at the final. The afternoon's program for the 15,000 devotees of the racing game consisted of three sprint races of 50 miles each. The fourteen drivers were divided into two groups of seven for the trial and the first four in each heat were started in the finals.

Fast Race Was Expected

In practice for the races Ralph DePalma had set a new record for the speedway by negotiating one lap at an average of 118 m.p.h., so the public was prepared for dizzy speed. The races had been postponed for a week and counter attraction tended to cut down the attendance, but the main grandstand and parking spaces were well patronized.

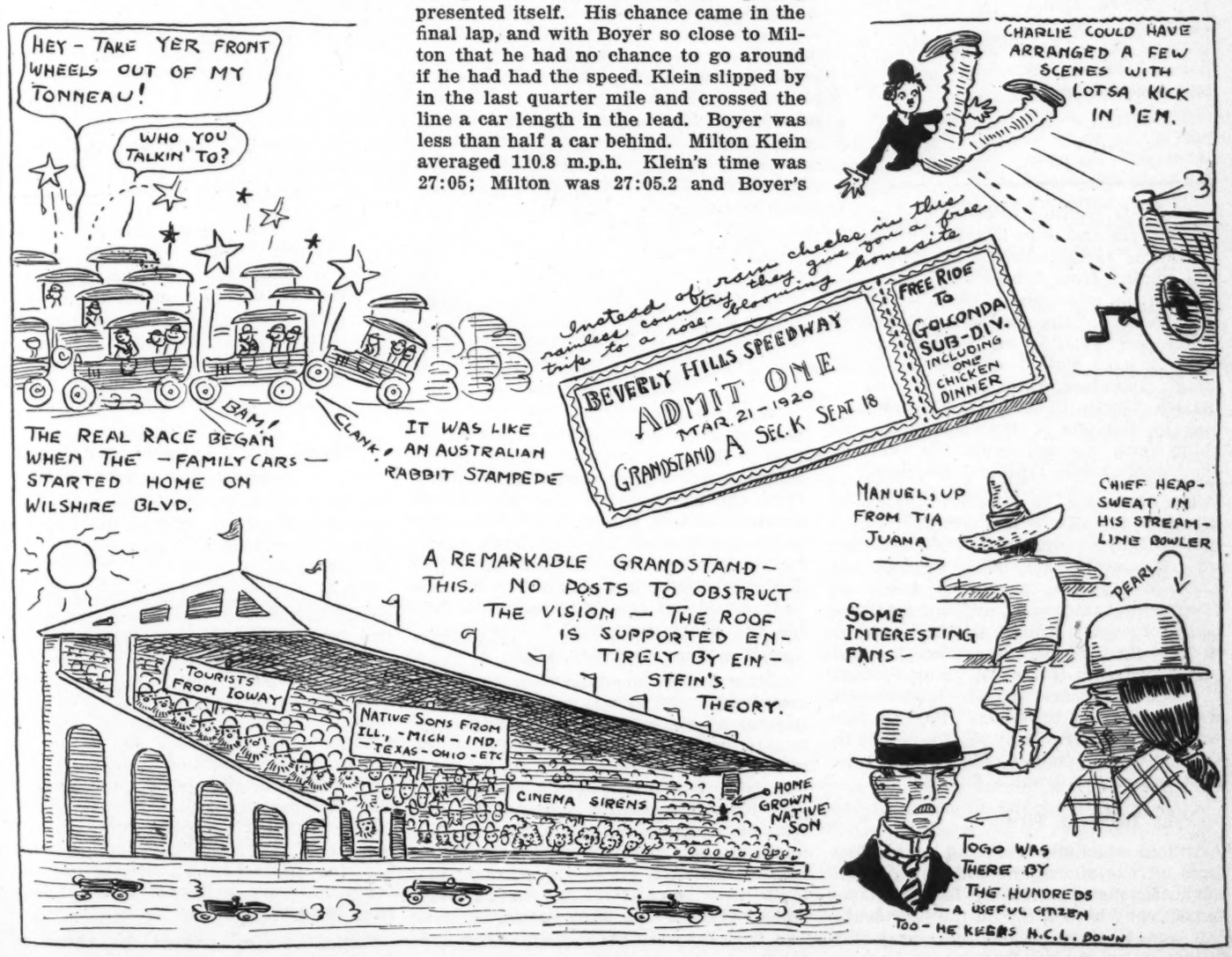
The start of the first heat was with John DePalma, Tommy Milton and Joe Boyer in the line-up. Thomas took the lead in the first lap and seemed to be trying to draw away from the bunch, but Klein, Milton and Boyer proved a relentless trio and the eighth lap showed Milton ahead with Thomas running fourth. In the ninth lap Hearne drew into his pit with a flat tire. Pit stops of any kind easily proved disastrous in a short race and there are drivers who quit, but Hearne soon resumed and this eventually won him a position. Vail had ignition trouble and the eleventh lap saw his doom.

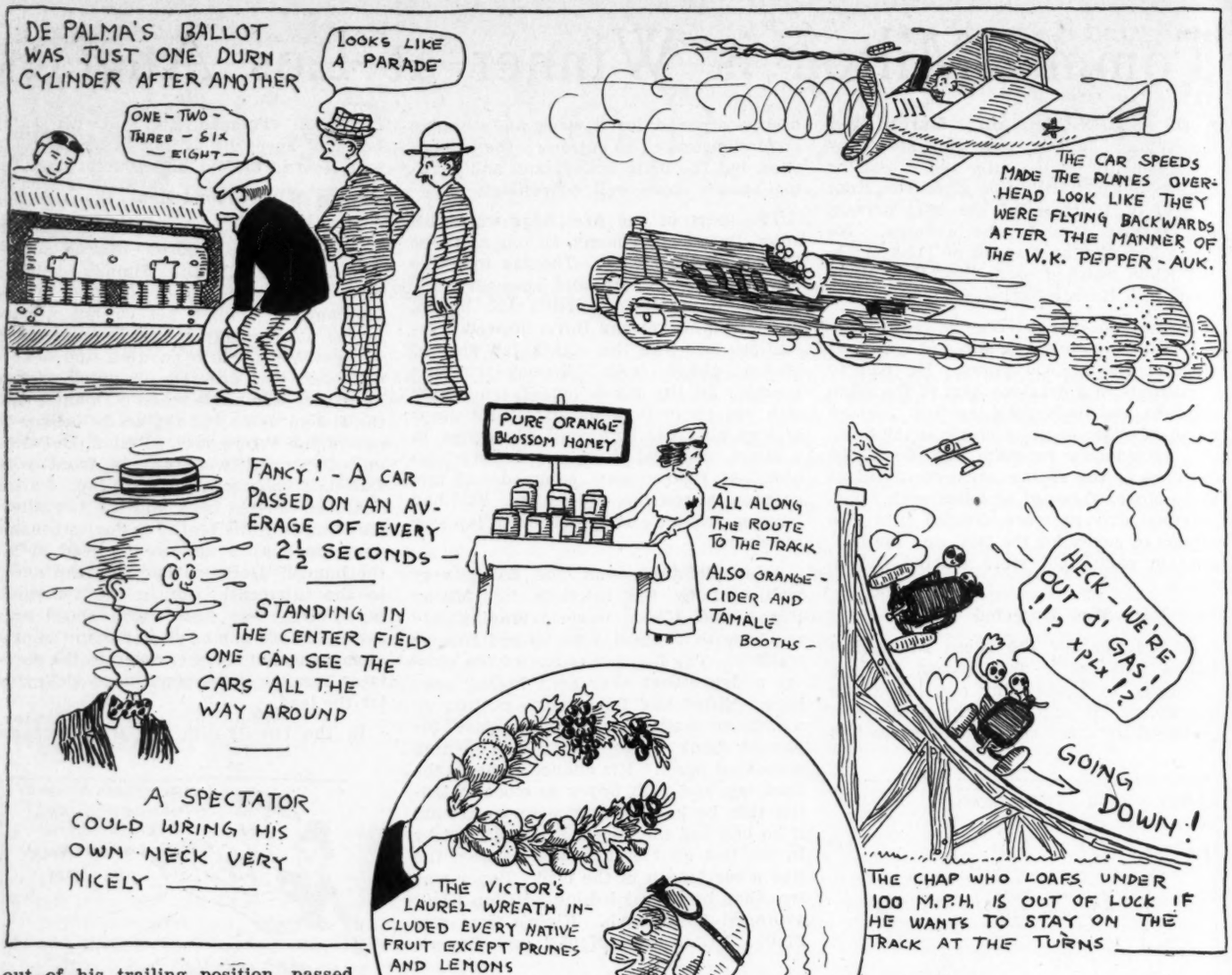
John DePalma was not doing very well and by the thirtieth lap Milton Boyer and Klein were averaging 110 m.p.h., with Thomas close up and Hearne trailing. The finish was one of the closest and prettiest ever seen in any race here. Milton and Boyer were putting up a terrific battle, with Klein just far enough back to see when an opening presented itself. His chance came in the final lap, and with Boyer so close to Milton that he had no chance to go around if he had had the speed. Klein slipped by in the last quarter mile and crossed the line a car length in the lead. Boyer was less than half a car behind. Milton Klein averaged 110.8 m.p.h. Klein's time was 27:05; Milton was 27:05.2 and Boyer's 27:05:22. Thomas paid for his early burst of speed by failing in the last lap and Hearne drifted into fourth place.

Murphy Wins Second Heat

Eddie Pullen, Bennett Hill, Ralph DePalma, Kenneth Goodson, Roscoe Sarles, Eddie O'Donnell and Jimmie Murphy went to the line in the second of the elimination. Pullen set so hot a pace in the starting lap that O'Donnell could not get Meteor into position and a second start was ordered. A quick change in drivers was made when O'Donnell cast the Meteor aside and replaced Goodson in one of the Frontenacs. Pullen, DePalma and O'Donnell went out in front with DaPalma leading in the sixth lap. Pullen snatched it right back and the two alternated until in the tenth lap Sarles became very much alive and went ahead of all the bunch. DePalma had the lead again in the thirteenth, but in the twentieth lap Pullen was first. The speed was averaging 108 m.p.h., slower than the previous heat, but more exciting to the spectator because of the continuous jockeying for the lead.

In the twenty-fifth lap Murphy came


HEY - TAKE YER FRONT WHEELS OUT OF MY TONNEAU!
WHO YOU TALKIN' TO?
BAM!
CLANK!
THE REAL RACE BEGAN WHEN THE - FAMILY CARS - STARTED HOME ON WILSHIRE BLVD.
IT WAS LIKE AN AUSTRALIAN RABBIT STAMPEDE
Instead of rain checks in this rainless country they give you a free trip to a rose-blooming home site
BEVERLY HILLS SPEEDWAY
ADMIT ONE
MAR. 21 - 1920
GRANDSTAND A SEC. K SEAT 18
FREE RIDE TO GOLCONDA SUB-DIV. INCLUDING ONE CHICKEN DINNER
CHARLIE COULD HAVE ARRANGED A FEW SCENES WITH LOTSA KICK IN 'EM.
A REMARKABLE GRANDSTAND - THIS. NO POSTS TO OBSTRUCT THE VISION — THE ROOF IS SUPPORTED ENTIRELY BY EIN - STEIN'S THEORY.
TOURISTS FROM IOWAY
NATIVE SONS FROM ILL., - MICH - IND. - TEXAS - OHIO - ETC
CINEMA SIRENS
HOME GROWN NATIVE SON
MANUEL, UP FROM TIA JUANA
CHIEF HEAP-SWEAT IN HIS STREAM-LINE BOWLER
PEARL
SOME INTERESTING FANS -
TOGO WAS THERE BY THE HUNDREDS
— A USEFUL CITIZEN TOO - HE KEEPS H.C.L. DOWN


DE PALMA'S BALLOT WAS JUST ONE DURN CYLINDER AFTER ANOTHER
LOOKS LIKE A PARADE
ONE - TWO - THREE - SIX — EIGHT —
THE CAR SPEEDS MADE THE PLANES OVERHEAD LOOK LIKE THEY WERE FLYING BACKWARDS AFTER THE MANNER OF THE W.K. PEPPER - AUK.
PURE ORANGE BLOSSOM HONEY
FANCY! - A CAR PASSED ON AN AVERAGE OF EVERY 2½ SECONDS —
STANDING IN THE CENTER FIELD ONE CAN SEE THE CARS ALL THE WAY AROUND
ALL ALONG THE ROUTE TO THE TRACK — ALSO ORANGE - CIDER AND TAMALE BOOTHS —
HECK - WE'RE OUT O' GAS! !!? XPLX !?
GOING DOWN!
A SPECTATOR COULD WRING HIS OWN NECK VERY NICELY
THE VICTOR'S LAUREL WREATH INCLUDED EVERY NATIVE FRUIT EXCEPT PRUNES AND LEMONS
THE CHAP WHO LOAFS UNDER 100 M.P.H. IS OUT OF LUCK IF HE WANTS TO STAY ON THE TRACK AT THE TURNS

out of his trailing position, passed the leaders and went into first place, where he remained until the finish. his coming from behind speeded up the battle and raised the average considerable. His time for the fifty miles was 27:10.8, an average of 110.3 m.p.h. Pullen was second in 27:27, DePalma, third, 27:37.6, and Sarles, fourth, in 27:42.1. O'Donnell had to stop for a tire change in the thirty-sixth lap and could not overtake the leaders again. Hill was distanced.

The final event to determine the championship saw Klein and Murphy, Boyer and Milton, Pullen and DePalma, Sarles and Hearne paired off. It was announced the Stutz previously driven by Hearne in qualifying could not start because of engine trouble and Hearne was at the wheel of the Frontenac that had just failed with O'Donnell. Murphy took the lead in the first lap and immediately was challenged by Klein. Boyer's fate was sealed early. He had a puncture in the second lap, made a change and in the next lap engine trouble finished him.

Murphy Blows a Tire

Milton seemingly went out to run the tires off the others and give Murphy an advantageous position in fourth place, but Murphy blew a tire in the fourteenth lap and it then became necessary for Milton to uphold the Duesenberg honors. He picked up a big lead over the entire field in the twentieth lap. Milton, Klein, DePalma and Pullen were running away from the others. DePalma set out to overtake Milton, but the lighter car was not to be headed and DePalma's speed forced him into the pit for new tire. With the stop he lost all chances. Hearne had passed out in the twenty-sixth lap, his car proving unequal to the strain.

Last Ten Laps One Man Affair

Milton made a one-man race out of the remaining ten laps, touring around a quarter of a mile in advance of time. He was followed by Pullen and Sarles. Murphy made up half the lap his pit stop had cost him, but that was not enough for him to place. Sarles has not figured with the leaders at any time, but the misfortunes of DePalma, Murphy and Hearne put him in fourth place. Milton's time was 26:52.2; Klein's was 26:58.6; Pullen's 26:58.8; Sarles, 27:29.8. The first three averaged better than 111 m.p.h.

This will be the last race at the speedway until Thanksgiving day. Boyer, Milton, Ralph DePalma, Hearne, Vail and Goodson leave here this week to drive on the one-mile dirt track at Havana, Cuba, April 10 and 11 and April 17 and 18. Frank Lowry, who started local events, goes along to act as starter at Havana.

TALES OF WAYSIDE REPAIRS

(*Continued from page* 31)

ing over the fall. The trees formed an appropriate setting, and on the whole it was a scene that an artist would enjoy looking upon.

"Just about when I was ready to become enthused over the scenery, some one yelled 'Hey, Mister! You're losing a wheel.' I looked out and sure enough the left side rear wheel was about to become divorced from the car. The axle stuck out about a foot, and all that was holding it in place was the grease on the shaft. Investigation showed that the split washer on the inside end of the axle shaft had parted company with the recess in the shaft. The closest approach to a washer of this kind that I had, was my key-ring where I keep a bottle opener and I couldn't very well part with the key-ring therefrom.

"After stewing around for about an

(*Concluded on page* 82)

Get Good Results From New Orleans Shows

Sales of $750,000 Are Traced to Crescent City Exhibits of Passenger Cars

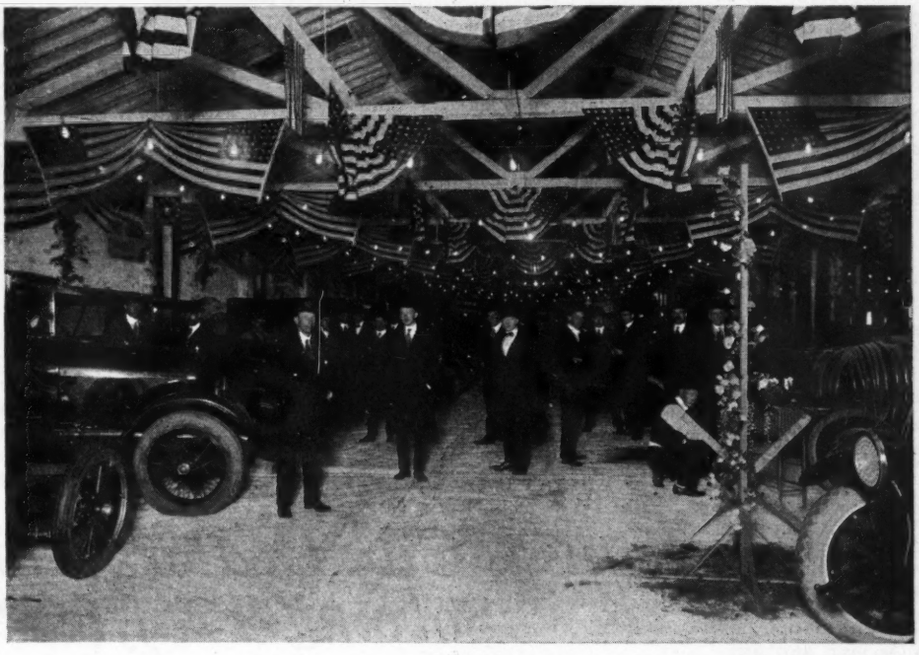
NEW ORLEANS, La., March 27—Results of the recent passenger car and truck and tractor show here are just beginning to be realized by the dealers. Sales resulting directly from the passenger car show, had reached, on March 20, a total of $750,000, while those resulting from the three days of truck and tractor exhibition, were estimated at between $60,000 and $75,000. Orders for both classes of automotives are still coming in, so that it will be several months before the total actual results of the largest show ever given in this section of the country will be known.

Passenger car dealers to the number of thirty-two had ninety-eight exhibits in the passenger car show, which was held the first week, giving place for the truck and tractor show. Lack of a large and suitable building in New Orleans alone kept at least as many more dealers from taking part in the passenger car show, while lack of space in the 30,000 sq. ft. covered by this structure, also kept out all but sixteen of the equipment dealers, who maintained their exhibits throughout both shows.

The shows were held by the New Orleans Automobile Dealers' Association, of which F. C. Bowman is president. Mr. Bowman named an auto show committee, consisting of L. C. Glenny, chairman; A. H. Borden, secretary-treasurer; Hamilton Barton, F. J. Weinberger, F .C. Bowman, L. J. Golding, L. R. McMillan and Fred Oster, which did the actual work of producing the show, after H. B. Marks, who had been engaged to put on the exhibition, had failed to reply to numerous telegrams and letters. Publicity, of which H. H. Dunn was put in charge, was conducted by means of multigraphed news stories sent to every one of the 300 newspapers published in Louisiana, Mississippi and east Texas, and by some fifty columns of matter published in the three New Orleans newspapers.

Attendance was approximately 25,000 at the passenger car show, and close to 3000 at the truck and tractor show, of which Fred Oster was in charge. The passenger car dealers seemed more enthusiastic than the truck and tractor dealer and thousands of tickets were purchased and sent out by the passenger car and equipment men to dealers and motorists in the outside cities and towns of Louisiana and Mississippi, as well as in New Orleans. The truck and tractor dealers did not handle so many tickets as did the passenger car men, and to this, doubtless, was attributable in large part the great falling off in attendance when the truck show opened.

Of the thirty-one truck and tractor dealers in New Orleans, however, twenty-six took space in the exhibit, entering forty models of trucks and tractors for the show, which was the first one of its kind ever held in the South. Sales were quite satisfactory from the truck show, and probably it accomplished more toward introducing the truck and tractor to hundreds of dealers and farmers in remote parts of Louisiana and Mississippi than any other one factor in the past several years. As far as figures are obtainable, there are only about 350 tractors at work in Louisiana, and approximately 1800 in Mississippi, so that there is a tremendous field for missionary work along this line in both states.



One of the two large aisles of cars which made up the passenger car show at New Orleans

One of the big results of the automobile show is the probability that the New Orleans dealers' association will start a movement, at the April meeting, for the formation of a stock company to erect a permanent home for the show, in the shape of an auditorium, seating 8000 to 12,000 and suitable for use for conventions and similar meetings in between the auto shows. Such an auditorium will cost in the neighborhood of $400,000, but it is estimated from the number of conventions held in New Orleans each year, that it will pay from 5 to 6 per cent on the money invested.

Fort Worth Sets Show Dates for April 12 to 17

Oil Fields Will Have Influence of Displays of Trucks, Cars and Tractors

FORT WORTH, Texas, March 26—The first annual spring automobile show to be held in Fort Worth, and what promises to be one of the best in the Southwest this year, will take place April 12 to 17, according to plans of the Fort Worth Automobile Dealers' association. Judging from the interest already manifested and the energetic manner in which the local dealers are working at the show, the displays will be among the best ever staged in this section of the nation.

Fort Worth, in the last year, has extended her automobile trade territory to the Rio Grande, and the majority of the dealers from the chief towns and cities of West Texas will take part in the big exhibition. Already the greater part of the display space has been reserved, and what is left is being snapped up as rapidly as dealers and manufacturers can get it.

While it is the plan of the local dealers to make an elaborate display of passenger cars of all makes and designs, trucks and trailers will not be overlooked. This is due to the fact that the oil fields laying adjacent to the city, a territory which Fort Worth is supplying, uses any number of big automobile trucks and trailers.

Henry Marks, one of the best known automobile men in the Southwest and a man who has made auto displays all over the country, will be in charge of the exhibition. Marks arranged the displays of automobiles at the State Fair of Texas last year and experts from the North and East declared his work was the most elaborate they had ever seen.

BROOKLYN TO SHOW EQUIPMENT

Brooklyn, March 27—Automotive products will have an extensive showing in an exposition of Brooklyn as a manufacturing center to be held in that city April 10 to 17. At an expense of more than $50,000 the Brooklyn Industrial Exposition is bringing together for display on one floor the products of Brooklyn factories.

Peugeot Racers Get First Test for Indianapolis Event

PARIS, March 13—The first of the 183 cu. in. Peugeot racers built for Indianapolis was taken on the road this week by Andre Boillot. The tests proved satisfactory, for the car was as fast as the 300 cu. in. Peugeots built before the war. The two other Peugeot racers will be on the road next week. Drivers of the Peugeot cars will be Jules Goux, Andre Boillot and Wilcox.

Ballot has definitely selected his team for Indianapolis, the drivers being Ralph De Palma, Jean Chassagne and Rene Thomas. The Ballot cars have eight cylinders in line. They are almost completed and will be on the road next week. It is possible that Ballot will enter a fourth car, of 122 cu. in. cylinder capacity. This machine is not expected to win, but is capable of making a good demonstration of speed and regularity. B. Ballot, the builder of these cars, intends to come to America with his team. This will be his first visit to the United States.

The Fiat racing engines for Indianapolis are stated to be on the bench. It is not yet known whether the cars will be ready in time for the Indianapolis trials.

Jean Porporato is preparing two cars for Indianapolis. He will drive one of these himself and give the other to Jack Scales, an Englishman formerly on the Fiat racing team. Porporato has completed his bench tests and will have his cars on the road at the end of the month.

Racing cars of 183 cu. in. capacity are being built at the Mercedes factory, in Germany. Pilette has made arrangements to secure one of these and will race at Indianapolis.

German Cars Are Not Wanted

Indianapolis, March 28—Intimation has been given prospective German and Austrian entrants in the eighth international 500-mile sweepstakes on the Indianapolis speedway, May 31, that it would be well to postpone all thought of competition for another year or two at least.

Following an exhaustive canvass of public sentiment from coast to coast that was instituted as the result of inquiries received by the speedway management from abroad, it was decided that it would be unwise to risk Teutonic competition at this time, a majority of public opinion being against it.

The speedway management itself assumed no voice in the matter, preferring to be guided by popular sentiment alone. A few votes in favor of resuming racing relations with the ex-powers of Central Europe were received, but on the whole the public attitude was strongly against them.

Unless the Germans and Austrians are completely discouraged over the present state of affairs, it is thought by the speedway management that they will attempt to gain entrance to an Indianapolis 500-mile race whenever public sentiment against them will have been sufficiently abated.

The Germans are seemingly anxious to renew relations with the rest of the world, and recognizing the prestige that would come to them from capturing an international event like the Indianapolis 500-mile sweepstakes, they have marked it for attention at the earliest possible moment.

This year, it was felt by the speedway management that German or Austrian competition would be attended by danger of personal injury outside of the race itself, an opinion that was fully vindicated by the storm of popular antipathy that broke when the public was let in on the affair.

GRANT BUYS WALKER MFG. CO.

Cleveland, March 27—Announcement was made here today that the Grant Motors Corp. has purchased a controlling interest in the H. J. Walker Mfg. Co. At the office of the Grant company it was stated that the management of the Walker company changed hands last Tuesday with the personnel of the plant practically unchanged.

The Walker Mfg. Co. has a capital of 100,000 shares, no par value, which is selling at $25 per share. The Grant company bought the stock owned by H. J. Walker, organizer and heretofore owner of the controlling interest.

The plans of the Grant company with reference to the new plant have not been completed, but for the present engines and certain parts will be produced. The capacity is 150 engines daily and the Grant company will take eighty of them. The rest will be sold. In addition, the jobbing work that has been carried on will be continued.

PROTECTS BATTERY SERVICE MEN

St. Louis, March 26—A plan has been devised by Capt. Robert E. Lee, secretary of the St. Louis Storage Battery Dealers' Association, whereby its members may be protected from unscrupulous owners of cars who may be inclined to make way with rented batteries. The plan, which is entirely new, consists of a secret mark, which is branded inside of the battery next to the positive terminal. The mark is about 2½ in. long, and each member-dealer will have an individual mark. These brands are all registered, and each dealer has a list. Every battery is examined for the mark before it is charged, and if it is found to belong to any dealer that dealer is notified and the battery held for his disposal.

SERVICE STATION IN RESIDENCE DISTRICT

Danville, Va., March 29—The residential section here is being invaded for the first time by the automotive industry, the Reynolds-Meador Service Co. having started the construction of a sales and service room in the heart of that part of the city. The firm, which is a new one, plans to conduct a general service establishment in addition to handling several lines of cars and trucks. Both members of the firm have been long established in Danville, the former in other lines of merchandising and the latter with the automotive industry.

Kansas City Dealers Aid in Solving Traffic Problems

KANSAS CITY, Mo., March 26—The motor car dealers and the truck dealers are taking a prominent part in the solution of traffic problems in Kansas City. The Kansas City Division of the National Safety Council, agitating for safety in industry, homes and on the streets, had organized a Public Safety Committee, particularly to attack the matter of street hazards. H. M. Genung, president of the Kansas City Motor Car Dealers' association, was made a member of this public safety committee. He attended its sessions, took an active part and when the plans for tackling street hazards were perfected, he was made chairman of the committee which will develop these plans, and put them into execution.

There will be a vigilance committee to observe and report infractions of traffic rules. These reports, and those by police officers as well, will result in the offenders being brought to a Traffic Safety Bureau, where they will be instructed in the traffic laws. The bureau will instruct not only motorists, who drive their own cars, but employes of companies using trucks. Only in cases of infractions of certain rules, will prosecutions be sought; these cases will be in three classes—passing a street car on the left, passing a standing car unloading or taking on passengers, and dangerous speeding. Mr. Genung's acceptance of the leadership in this particular branch of the safety campaign, puts the motor vehicle dealers squarely on the side of proper driving, of education rather than prosecution for violations due to ignorance, and of the constructive effort to make streets safe for the motorists and pedestrians against the few who are reckless and inconsiderate.

CEDAR RAPIDS TO HOLD RACE

Cedar Rapids, Iowa, March 28—The Cedar Rapids Motorcycle club will stage a 300-mile endurance race May 26. The course will be from Cedar Rapids to Iowa City to Clinton and return to Cedar Rapids. Three times around the course

will complete the 300 miles. Announcement of the meeting of motorcycle riders was made recently by H. G. Forbes, secretary of the club. Definite details are being perfected, and final arrangements will be made soon.

In addition to Cedar Rapids riders and club members, it is expected entries will be received from Iowa City and Waterloo clubs. Prizes will be offered for the winners and the competition is expected to be interesting. In order to qualify as a winner, it will be necessary for each rider to average 25 m.p.h., for the entire distance. Special registration stations will be established where the different machines will be recorded as they pass.

If the meet goes over in satisfactory manner, the national association of motorcycle riders has signified an intention of accepting the local organization, which is headed by Gordon Hughes, president, and is composed of about sixty members.

BOULDER DEALERS ORGANIZE

Boulder, Colo., March 26—The Boulder Auto Trades' Association was organized this week with W. S. Withers of the Ford agency as president. The object of the association, as outlined, is to secure cooperation and understanding between dealers in automobiles and accessories in Boulder, to promote good roads and to urge legislation favorable to the automobile industry.

Officers are: Vice-President, Lloyd Bouten of the Overland; secretary, Bob Carlisle of the Boulder Motors Co.; treasurer, Jack Faux, Cole. These men with Mr. Withers and W. L. Cox and Mr. Wood of the Boulder Rubber Tire Works, make up the board of directors. On May 18, a delegation will attend the Northern Colorado Dealers' Association at Fort Collins.

United States Urged to Join in International Road Congress

WASHINGTON, March 26—That the United States should accept the invitation of foreign countries to join the Permanent International Association of Road Congresses is the recommendation of the executive committee of the American Association of State Highway Officials to the Secretary of Agriculture. The committee which has just concluded a two-day conference here considered, at the suggestion of Secretary Meredith, the invitation to the United States which had been received through the State Department from the American Consul General at Paris. Secretary Meredith concurred in the action of the highway officials and told them he would recommend to the State Department that Congress be asked to authorize acceptance. The highway officials also recommended that the International Association be invited to the United States for its next meeting.

In advising the Secretary of the action of the state highway officials, Thomas H. MacDonald, Chief of the Bureau of Public Roads, who is also a member of the executive committee, said that the United States is the only civilized nation not now a member of the International Association. He saw many advantages in the United States becoming a member and he believed the other nations in the association would welcome an invitation to meet in this country next year. The Roads Congress, he said, constituted an international tribunal for bringing together the best experience and results in highway construction and administration. Although meetings have been held each year, none has been called since the European war began. Before the war the Congress had met in Brussels, Paris and London.

Secretary Meredith notified the highway officials that he would enlarge the advisory committee of State highway officials, which consults with the Department on Federal policies in road building. This committee, consisting of six members, will now include the entire executive committee of the American Association of State Highway officials, increasing its membership to twelve. The Secretary said this step was taken so that the committee would more completely represent all parts of the United States. The enlarged membership will enable the advisory committee to work out a classification of roads for the entire country, thereby providing a basis for a more orderly national program of road building.

The executive committee inspected a signal device to prevent grade crossing disasters and accidents on dangerous curves. It met with the Director of Sales of the War Department with reference to obtaining equipment which is seriously needed in road building and which the States have been unable to secure.

PARIS MAKERS DIFFER ON SHOW

Paris, March 13—By twenty-two votes to fourteen the French syndicate of automobile manufacturers, which corresponds to the Automobile Chamber of Commerce, has voted against any show in Paris in 1920. This merely confirms the vote taken by the presidents of all the trade organizations interested in the Paris Salon a few weeks ago. The Chambre Syndiacle is the most powerful of the trade organizations in France, for it controls practically all the automobile manufacturers of that country.

The minority is much dissatisfied with this decision and threatens to take such action that an automobile show will be held despite the vote. It is claimed by this minority that the 1920 show has been abandoned in order to prevent the younger firms from gaining a footing on the world's market. If the minority in favor of a show breaks away from the majority, it will be practically impossible for them to secure the Grand Palais in the Champs Elysees. This, however, will not prevent them from holding a show in some other central hall in Paris.

The main argument of the majority is that they have not yet got into production on the models exhibited in 1919, and will only have begun production on an important scale by the end of the summer of 1920. They claim therefore that they will have nothing new to exhibit and that there is no necessity for a show. There is a strong hope among the anti-show section that England and Belgium will follow their decision.

Farmers Adding Trucks to Their Equipment in the East

WASHINGTON, March 28—Farmers in the eastern section of the United States have been adding motor trucks to their farm equipment rapidly during the past three years, according to figures obtained by the United States Department of Agriculture, which is investigating the use of motor trucks by farmers.

Reports from approximately 1000 farmer truck owners in the New England states, New York, Pennsylvania, New Jersey, Delaware and Maryland during January and February, show that at that time over 80 per cent had owned their machines less than three years. The length of time 955 of these men had owned their machines is as follows: Less than one year, 373, more than one year but less than two, 237; more than two years but less than three, 181; more than three years but less than four, 86 more than four years but less than five, 37; more than five years 41.

These reports were all from farmers who had purchased new trucks for their individual use. Reports on second hand machines and on truck attachments for pleasure cars, as well as trucks used primarily for custom work or on regularly established routes, were not included in the count. While it is impossible to determine just how many of the trucks which have been in use only one or two years were purchased to replace other trucks, worn out or discarded, it is known that a large percentage of the reports covers first experience with trucks.

FORD SERVICE EQUIPMENT

In the March 4 issue of MOTOR AGE, on page 9, was shown a group of photographs credited to the Herring Motors Co., Des Moines, Iowa. Credit for the top and bottom illustrations should have been given the Ford Motor Co., Des Moines, which concern held special mechanical clinics during show week. The two illustrations were of the equipment the concern used in its demonstration work.

Texas to Investigate Alleged Fuel Trust

Charges Made That Oil Firms Also Are Attempting to Gain Control of Motor Car Prices

AUSTIN, Tex., March 26—Information has been placed in the hands of the State Attorney General's Department by T. J. Newton, county attorney of Bexar county at San Antonio, alleging that combines have been entered into by several of the large oil corporations operating in Texas for the purpose not only of controlling the price of gasoline but of exercising control over the prices of automobiles and automobile accessories. He asks that the attorney general institute suits against these companies for alleged violations of the anti-trust laws of Texas. Attorney General C. W. Cureton took the matter of prosecuting the oil companies under advisement.

Mr. Newton charges that these large oil companies are reaching out to control the automobile business, in addition to controlling the prices of their own products. He said that in San Antonio and elsewhere in Texas the big oil companies have installed automobile accessory supply houses in connection with their gasoline filling stations.

Seek to Establish Monopoly

In speaking of the situation, Mr. Newton said:

"From what I can gather the oil companies are seeking to establish a complete monopoly of their products, and prices checked by the enforcement of our anti-trust laws and laws against monopolies, will eventually absorb or force into retirement, all independent refineries and all of the distributors not in with them, and the consumer will hold the bag."

He declared that under both the state and federal laws it is possible to check the further operations of combines, saying:

"Under the laws of the United States and the state of Texas a check can be placed upon these oil companies. These laws must be put into operation without delay; otherwise, ere long, the consumer will not only have to buy his accessories and supplies from the oil companies, but they will also have to look to the oil companies for their automobiles. Just a repetition of the 'Packers' Trust.'"

Mr. Newton said he proposed to lend the Attorney General's Department every aid at his command to remedy the evil, and that he believes speedy action would be taken.

Investigations Under Way

"The Attorney General's Department had made some investigation of the question, prior to 1918," he said. "I supplied results of an investigation covering the period since that date, and tendered my services and information to him, and asked him either to come personally to San Antonio or send a representative here to begin a further inquiry, if he deemed it necessary before taking legal action."

Mr. Newton believes that the information he has at hand is sufficient to authorize legal proceedings and favors immediate institution of suits which he believes will result in either dissolving the big companies or compelling them to reduce prices.

OVERLAND TO INCREASE CAPITAL

Toledo, March 25—A considerable increase in the capitalization of the Willys-Overland Co. is believed to be planned by directors of the company in an effort to increase production facilities and to effect greater economies in manufacture. Present output of Overlands is in excess of 600 per day and is expected to increase to 800 per day by spring. Demand, however, is increasing even more rapidly than production, hence the plans for increased capitalization.

Montreal Dealers Hold Their Annual Meeting

Good Attendance and Much Enthusiasm Marks Gathering of Canadian Motor Men

MONTREAL, March 26—The annual meeting of the shareholders of the Montreal Automobile Trade association was held here last week. There was a large attendance and much enthusiasm displayed.

The retiring president, J. C. Linteau, read the report. He said that immediately after the shareholders' meeting in 1919, the board appointed an active secretary to take charge of the office of the association, and the board to-day is glad to state that they did not err in their choice.

The three sub-sections had been organized and they had been eminently successful. The number of these associated members is classified as follows: Thirty for the automobile sub-section, thirty-seven for the automobile equipment subsection, thirty for the garage sub-section, making a total of ninety-seven.

As soon as installation allowed it, steps were taken to enable the association to issue automobile licenses for the Province of Quebec, through their active-secretary, thus saving patrons the necessity of waiting hours at the revenue office.

Help Traffic Regulation

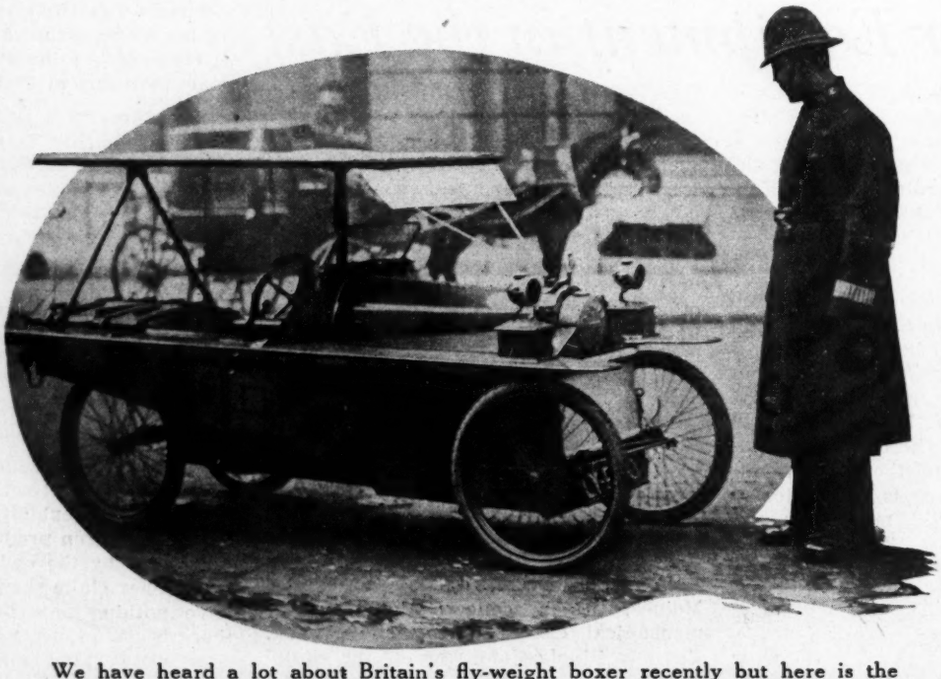
Conferences were held with the chief of police and the chief of detectives concerning the regulation of traffic in the city and measures for the protection of cars' owners against theft and robbery.

The show that had taken place was a huge success. It had been the most representative and complete show ever held in Canada. Its financial success was given by the treasurer.

The association counts to-day fifty-one shareholders and ninety-seven associated members.

The secretary, J. R. Marlow, said that the sub-sections 1, 2 and 3 operating under the by-laws, as admitted at the last meeting of the shareholders, have all been properly organized and are operating.

England also produces fly-weight cars—



We have heard a lot about Britain's fly-weight boxer recently but here is the champion of the fly-weight class in the motor car field

See Higher Prices in Prospect for Gasoline

Bureau of Mines Looks for a Further Increase in Costs Due to Larger Car Production

WASHINGTON, March 22—Higher prices for gasoline are foreshadowed by a report issued to-day by the Bureau of Mines. Gasoline production, according to the report, increased 10 per cent in 1919. Automobile registration, according to figures secured by MOTOR AGE increased 23.2 per cent during the year. And as the quantity of gasoline in storage has been increasingly slowly while sales of automobiles promise even greater increases this year, it is inevitable, state various officials, that gasoline by reason of the demand will advance in price.

On Des. 31, 1919, 292 refineries were operating with a daily capacity of 1,356,355 bbl. of crude oil. In 1917 there were 245 companies producing 1,157,875 bbl. daily and in 1918, 267 concerns refined 1,226,175 bbl. a day. Ninety-nine new refineries are in process of construction and will be in operation by August, 1920. Texas leads in new construction with 50 plants with daily capacity of 141,000 bbl.

Production Increased 10 Per Cent

Gasoline production increased 10 per cent over that of 1918, October being the high month and January the low month in production. Stocks on hand were largest at the refineries at the end of May and lowest in January and October, indicating the seasonal demand. Due to the termination of the war the stocks increased during the year from 297,326,983 gal. to 446,793,431 gal., while exports decreased 190,000,000 gal. in contrast to an advance in domestic consumption amounting to 309,000,000 gal. The total production for 1918 reached 3,982,569,796 gal. as against 4,255,184,080 gal. in 1919, while domestic consumption in 1918 amounted to 3,116,610,522 gal. as compared with 3,426,290,557 gal. in 1919.

Gas and fuel oil production increased 4 per cent during 1919 with stocks in storage increasing rapidly from low to high reserve until September when they started a decline that has maintained steadily and rapidly to date. Exports of gas and fuel oils decreased 303,000,000 gal. but shipments to insular posessions increased by 63,000,000 gal. and domestic consumption by 571,000,000 gal.

Kerosene has increased consistently in production since August, 1918, and the 1919 increase amounts to 28 per cent over 1918. Domestic consumption declined by 50,000,000 gal., while exports increased by 480,000,000 gal., but despite this the condition of kerosene reserve remains excellent.

Lubricating Oils Are Steady

Lubricating oil maintained a steady production throughout the year with a 1919 production of 846,760,017 gal. as against 972,322,115 gal. in 1918. The domestic consumption totaled 568,382,979 gal. in 1919 and 580,552,186 gal. in 1918 while reserves on Dec. 31, 1919, amounted to 137,318,934 gal. and in 1918 to 138,853,574 gal., the decrease caused by an advance of 20,000,000 gal. in exports.

During 1919 the 430,465,567 bbl. of crude oil produced and imported were accounted for as follows: 5,925,586 bbl. exported, 328,879 bbl. shipped to our insular possessions, 361,520,153 bbl. refined, and 62,690,949 bbl. consumed in the natural state. Of the 52,746,567 bbl. imported, 30,828,264 bbl. were from Mexico and run in American refineries.

TO CARRY ON TAX FIGHT

Cleveland, March 28—Holding that the newly enacted Ohio graduated automobile license law is contrary to the fourteenth amendment to the United States constitution, the board of directors of the Ohio Automobile Association has unanimously voted to carry the case to the U. S. Supreme court. An adverse decision was given in the Ohio Supreme Court recently. It is claimed that the law in question amounts to double taxation and thus is opposed to constitutional principles. Among those who took this action were C. D. Saviers, J. L. Will and Charles C. Janes of Columbus, Frank Collucci, Lima, Fred H. Caley, Cleveland and Rev. Joseph H. Dodshon of Zanesville.

It was decided to hold the annual convention in Zanesville May 28, 1920.

Georgia Asks $40,000,000 Good Roads Bond Issue

Legislature Will Act on Measure This Session Before Submitting it to Referendum

ATLANTA, Ga., March 27—If the Georgia state legislature acts favorably upon an amendment to the state constitution now pending in the general assembly, which will be heard at the next session, Georgia will have an opportunity to vote on a bond issue of $40,000,000 or $50,000,000 for the construction and improvement of roads throughout the state. And if the matter does reach the polls indications are that public opinion favors the project to such an extent that it would carry without a great deal of opposition.

Women Help Bill

The Atlanta Woman's Club has just organized a good roads committee that will, in its turn, organize the women of the rural districts and endeavor to prove to them the real worth of good roads and a good system of highways throughout the state. It is the belief of the club executives that if the rural women can be interested to the extent that they will regard the matter in a favorable light, they can bring sufficient pressure to bear on the voting members of their households to assure the passage of the proposed amendment to the constitution which will provide the enormous bond issue.

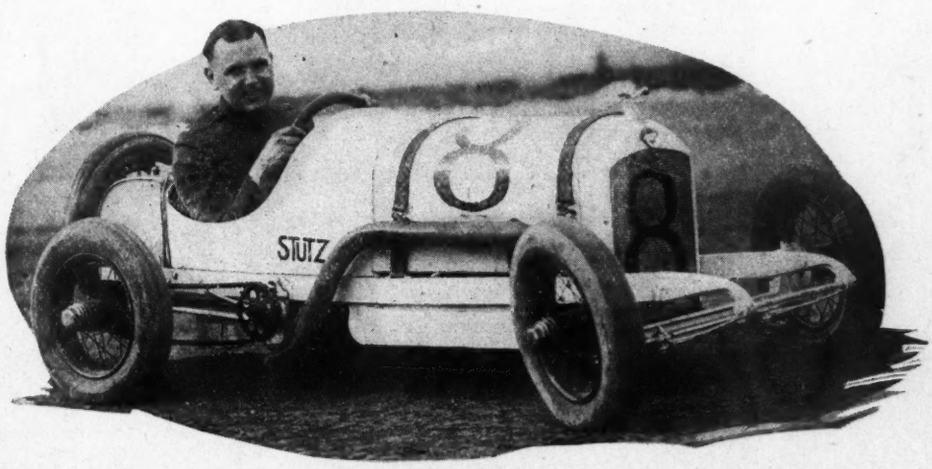
The issue, if passed in the legislature, will be submitted to a referendum of the voters at the election this fall.

JORGENSEN TO ENLARGE FIELD

Waupaca, Wis., March 19—Quintuplication of the capitalization of the Jorgensen Mfg. Co. has been effected for the purpose of enlarging the field of products made by the company. The capital has been increased from $70,000 to $350,000. In addition to increasing the production of the Jorgensen Primer, the company proposes to engage in the manufacture of a new three-way valve for use on tractors to facilitate shifting from kerosene to gasoline fuel, a new lifting jack and a line of brass engine fittings.

Arangements have been made with the United Motor Service whereby that organization handles all sales to the jobber and dealer trade of the Jorgensen products.

—and we have some here, too



Here is Lieut. Plumb in the pocket-edition Stutz he used for his quick runs around Kelly field

Illinois Forms a Comprehensive

Take in Dealers in Accessories and Tires as Well as Garages to Make Organization Really Representative of Industry

SPRINGFIELD, Ill., March 26—Illinois took a tremendous step forward this week in the organization of its new Illinois Automotive Dealers' Association. Even before it had completed its organization convention it had outgrown its name, a fact which undoubtedly will become clear to the organizers when the true scope of the new body becomes clear to them. Instead of the Illinois Automotive Dealers' Association, the new body should be known as the Illinois Automotive Association, for car and truck dealers are only part of the big association.

Every branch of the automotive and allied industries has been included in the comprehensive organization of the Illinois association. Passenger car, truck and tractor dealers come in as a matter of course, but they will form only a minority of the membership of the society, although they have taken steps to keep control of the organization, temporarily, at least, in their own hands. Accessory dealers, tire dealers, garage owners and operators and even car manufacturers are included in the new association.

The Illinois convention undoubtedly marks the beginning of a new era in automotive organization in the Middle West. Originally conceived as a statewide association of car, truck and tractor dealers, it has already outgrown that idea. It is the one big state automotive organization which truly represents every branch of the automotive industry and as such undoubtedly will prove an extremely important factor in shaping motor car legislation in the state and in the nation at large.

Officers of the Illinois Automotive Dealers' Association:

President—H. B. Pinkerton, Peoria.

Vice Presidents—L. A. Piel, Chicago; Morris Adler, Quincy; Ray Sparks, Champaign; Frank Jennings, Springfield.

Treasurer—T. J. Hay, Chicago.

Directors—R. C. Cook, Chicago; W. H. Taylor, Chicago; Ward Perry, Chicago; H. E. Halbert, Chicago; B. B. Burns, Decatur; Paul Killeen, Galesburg; H. F. Horsman, Alton; Ed Speigel, Kewanee; W. H. Williams, Rockford; R. C. Schell, Beardstown; J. Murray, Bloomington; Harry Schnyder, Danville.

Permanent offices and headquarters will be located in Springfield.

As a truly representative organization, the influence of the new body in influencing legislation undoubtedly will be wide. Gov. Frank O. Lowden, in addressing the convention on the first day, declared that administrative authorities have always welcomed expressions from organizations which actually represent any industry or any real interest so long as they could be assured that these organizations were truly representative. There is no question of the representative qualities of the I. A. D. A., for it takes in every branch of the industry.

Perhaps the most pleasing thing about the convention was the number of disputes which arose on the floor of the convention. There were controversies between the car dealers and the truck dealers, between the combined trucks and car dealers and the accessory dealers and garage men, between the car dealers of Chicago and the car dealers of "downstate." And these were real contests and by their very warmth demonstrated that there was a real interest in the new organization; that it was not merely a perfunctory banding together because banding together just now seems to be the fad.

The warmth of the contests between various opposing interests is the most promising aspect of the entire convention, unless we except the readiness with which these same opposing interests buried their minor wishes in their desire to work for the good of the whole organization. The convention itself was not harmonious; far from it. But the convention wound up in perfect harmony, with every interest voicing its satisfaction with what had been done and promising to go out and work for the association.

H. B. Pinkerton, of Peoria, N. A. D. A., state vice-president for Illinois, presided at the opening sessions and after a com-

The State Capitol at Springfield was chosen as the convention hall for the organization of the Illinois

Automotive Trade Association

Vehicle Dealers, However, Maintain Right to Predominate in Body t Protect Their Heavier Financial Interests

mittee to draft a constitution and by-laws had been appointed, the convention was addressed by Harry B. Moock, secretary-manager of the National Automobile Dealers' Association.

The report of the committee on by-laws was the signal for the first controversy of the convention. The by-laws carried the provision that the presidency of the association be limited to dealers in motor cars, trucks or tractors, excluding accessory, tire and equipment dealers, garage men and manufacturers. A further provision gave the car, truck and tractor dealers seven of the twelve directors, a clear majority of the board.

Immediately representatives of the accessory men and garage men were on their feet protesting against what they termed discrimination. Numerous rather acrimonious speeches were made on both sides of the question until T. J. Hay of Chicago, a passenger car dealer and a member of the by-laws committee, took the floor

Instead of attempting further to becloud the issue, Mr. Hay came out openly and declared that the discrimination had been made intentionally, that inasmuch as the automotive vehicle dealers had already perfected organizations of their own far beyond what any of the allied interests had been able to do, he believed they were entitled to have the leading part in the state organization.

He also pointed out that inasmuch as the garage men and accessory dealers outnumbered the car, truck and tractor dealers in the state by a ratio of three or four to one, although the latter had far more at stake financially, it was imperative for the vehicle dealers to take precautions to protect their larger interests.

Mr. Hay's straightforward statement of the position of the vehicle dealers had the effect of clearing the atmosphere al-

As an indication of how little figure price cuts in present merchandising, E. S. Jordan, president of the Jordan Motor Car Co., in the course of his talk on "Automobile Merchandising," turned to the 150 dealers who were in the room and asked quickly,

"Can anyone in this room who is not a Ford dealer tell me the price of a Ford car? Can anyone not a Dodge dealer tell me the price of a Dodge? Anyone not a Cadillac dealer tell me the price of a Cadillac?"

Not a dealer in the room was able to give the correct price of any car he was not at present handling.

most at once and the by-laws were adopted unanimously, the men who at first opposed the sections mention admitting the reasonableness of Mr. Hay's stand.

The only other dispute of serious import came in the second day's meeting when the question of dues was discussed. Dues of $15 per year were decided upon with the provision that where local organizations came into the state association in a body, $15 should be charged for each of the first 50 members and $7.50 for each additional. This applied except in the case of Chicago, where $15 was charged for the first 100 members and $7.50 for each additional membership. The old animosity between Chicago and "downstate" crept out in this detail but when it was pointed out that Chicago was coming into the state association with more than 270 paid-up members, the controversy quickly subsided.

More than 600 members were pledged to the association on the adoption of the constitution and by-laws and it is expected that this will be augmented to more than 1000 when the first report of membership is made up April 15. Chicago headed the list with 271 members, while the following local organizations pledged their entire membership: Rockford, 43; Decatur, 22; Peoria, 60; Alton 25; Quincy, 34; Champaign-Urbana, 40 to 100; Kewanee, 40; Jacksonville, 25; Bristol County, 12; Galesburg, 24; Beardstown, 24; Springfield, 23. Besides this, there were informal promises of the entire membership of the Chicago Garage Owners' association, numbering 251 members, and the state garage association, numbering an additional 400.

Annual dues for garage owners and accessory dealers were fixed at $7.50 per year for members having $1000 or less

Automotive Dealers' Association. Here are some of the delegates photographed on the steps of the building

in stock investment and $15 per year for members carrying more than that in stock.

An extremely interesting program was prepared for the convention besides the regular business sessions. Gov. Frank O. Lowden of Illinois and Harry Atwood gave interesting talks at the banquet which wound up the first day's session, the former pledging his co-operation in the work of the association and stating that he favored a national highway program in co-operation with state and county programs.

E. S. Jordan, president of the Jordan Motor Car Co., spoke on "Automobile Merchandising" at the luncheon given the second day, while in the afternoon L. A. Peil, president of the Chicago Automobile Trade association, outlined the achievements of that organization in the last year as a possible guide to the state association; George Fritz, field secretary of the Automotive Equipment association, spoke on "Automotive Merchandising," Charles Hendy, Chicago Branch Manager, Ford Motor Co., on "White Paint," Pyke Johnson, Washington representative of the N. A. D. A., on "Road Building from the National Viewpoint," and A. R. Koh of the Ship-by-Truck bureau on "Motorization of the Farm." In the evening the delegates were entertained at a boxing show arranged by the Springfield Dealers' association.

TELLS OF NEW MIDWEST ENGINE

Chicago, March 27—A paper on the design of the Midwest truck and tractor engine, presented before the Midwest section, S. A. E., by Mark Smith, of the engineering department of the Midwest Engine Co. of Indianapolis, asserted that the latest type of Midwest engines are fitted with a 3 in. crankshaft, running in bearings that fit the shaft journals to 0.004 in., and since no oil grooves or oil distributing passages are employed, an unbroken film of oil that pencils itself outward from the bearing center, prevents a metal to metal contact, thus making it unnecessary to ever take up the bearings of the engine. Mr. Smith further said, that in support of this statement engines had been run continuously for periods more than a thousand hours under full load and the original marks in the babbit metal as made by the reamer, were still visible.

An interesting discussion took place regarding the high compression of the engine, which is 74 lb. per sq. in. for kerosene, and the absence of the detonation which is general and common with compression pressures of this amount when burning kerosene.

TRAFFIC TRUCK PRICE ADVANCED

St. Louis, March 13—Prices for the 2-ton chassis of the Traffic Motor Truck Corp. have been advanced to $1495.

CLEVELAND SERVICE MEN MEET

Cleveland, March 26—At a meeting of the Service Division of Automotive Association held at the Cleveland Chamber of Commerce March 17 it was demonstrated that the interchange of ideas among service men need not be restricted to local work. Ralph C. Rognon, president of the Automotive Service Association of New York, was the speaker of the evening. His address was, "The Motive of the Service Organization Should Meet the Owners' Requirements." The meeting was well represented and discussion was lively.

The difference between serving the public in large cities, small towns and the country was discussed, together with many other interesting subjects. It was proven service is purely a local problem, and that the interchange of ideas in association work can be greatly benefited by one member of a service association from a different locality addressing other service men.

Elmer Apperson Dies

LOS ANGELES, March 28—Elmer Apperson, president of Apperson Bros. Automobile Co., Kokomo, Ind., died here suddenly of apoplexy while watching the speedway races. Mr. Apperson was 58 years old and had recently suffered several apoplectic attacks.

Mr. Apperson was one of the pioneers of the motor car industry, he and his brother Edgar Apperson being associated with Elwood Haynes in the earliest days of the business. In 1901 the Appersons broke away from the Apperson-Haynes company and formed the Apperson Brothers firm. Although in recent years, Elmer has continued as president of the company, active management has been in the hands of his brother.

USED CAR SHOW A SUCCESS

St. Louis, March 25—Results of the recent used-car show, which was conducted by 24 of the dealer-members of the St. Louis Automobile Manufacturers' and Dealers' Association show that 126 of the 235 cars that were on exhibition were sold. Last year 83 per cent of the cars exhibited were sold, as against 55 per cent this year. At this year's show, which was held in the old Southern Hotel Building, the admission fee was fifty cents, as against twenty-five cents this year. It is thought that this may have had some effect on the attendance and sales.

The dealers represented in the group that held the show took page space in the daily newspapers. They did more than to advertise the show, they advertised used cars, and pointed out that the reputation of these companies stood behind the used cars they sold, and created a desired confidence in used cars.

TO INVESTIGATE "GAS" PRICES

Washington, March 28—Investigation of increasing prices of gasoline and other oils was proposed in a resolution introduced yesterday in the House of Representatives by Congressman Dyer of Missouri. The resolution calls upon the department of justice to make an investigation immediately of the oil situation and to report to Congress the reasons for the present high prices.

Gasoline prices have advanced four times since the beginning of this year, according to Congressman Dyer, who stated that further increases are expected and he indicated that a combination in restraint of trade may be responsible for the advances. Mr. Dyer plans to ask early action on his resolution because of the belief of officials here that the price of gasoline will soon be advanced to 40 cents.

RIM FIRM ENLARGES

Atlanta, Ga., March 27—The Oliver Rim Co. will start the manufacture of the Oliver double jointed rims, a new invention, in its plant here about April 1. The new plant has been entirely completed and machinery is now being installed.

It was first planned to start at a capacity of 500 rims daily but at this rate already the first year's entire output has been contracted for, and therefore the company will immediately begin the erection of the additional unit that will give increased daily capacity up to 2,000 rims. The new unit will be 50 by 160 ft., providing 8,000 sq. ft. of floor space and giving the company a total of 23,000 sq. ft. of space. Contract for the erection of the additional building has already been let.

There are about 1400 stockholders of this company in the Southeastern states, most of whom are engaged in the automobile or garage business.

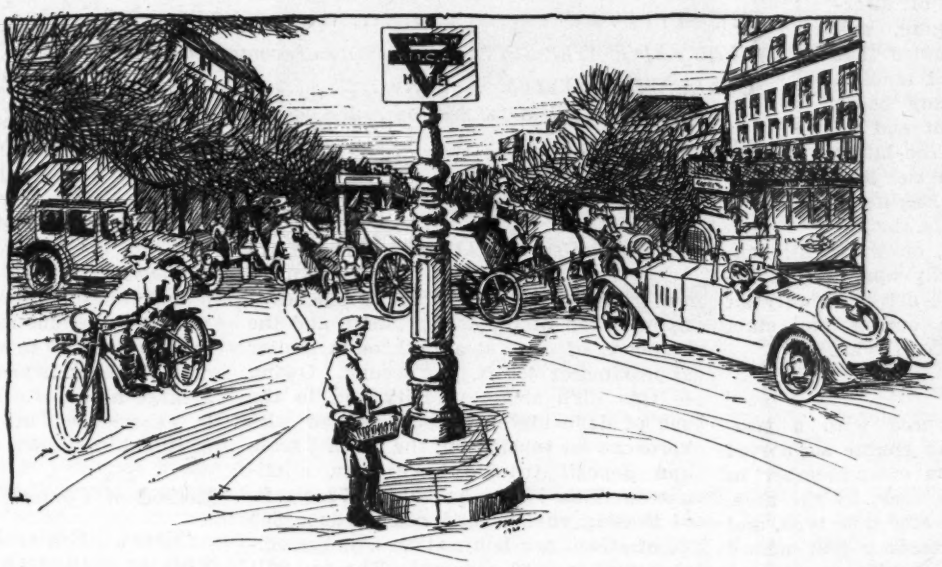
WE CORRECT AN ERROR

A typographical error in the story dealing with the increased prices of Hudson and Essex cars in MOTOR AGE of March 4 made the price of four and seven passenger cars $2000. The cars which formerly sold at $2200 now sell at $2400.

Paris to Try Yankee Traffic Methods

PARIS, March 11.—Maj. George H. Robertson, Chief of Transportation, Air Service, American Army, now handling the European transportation for the American Red Cross, has been showing the French police how to take the tangle out of street traffic.

Since the armistice the Paris streets have become more congested than they were before the war. The average driving skill is lower now than it was in 1914 and the spirit of recklessness is higher. As a consequence, accidents are increasing daily, and at certain rush hours, the more crowded portions of the city are traffic jammed. From time to time the Paris police issued wonderfully efficient traffic rules, but they never seem to decrease traffic tangle.



A few days ago the Chief of the Police requested Maj. Robertson to give them a plan for handling traffic in the most congested quarters of the city. He prepared a scheme and offered to give a practical demonstration of its application.

Takes Charge of Paris Traffic

In consequence, the American officer took charge of the street traffic at the Printemps corner for one afternoon, and showed the French police how to control vehicles. This particular corner is the most congested of all Paris, for six important highways converge at this point, and there are in addition four trolley tracks. Maj. Robertson, with his staff of French policemen, controlled the traffic with clock-like regularity for three hours, then turned it over to the French Brigadier. While he was in charge, Maj. Robertson controlled the different streams of traffic by whistles on the system employed in large American cities. When the French policeman took charge one of his first acts was to blow his whistle to stop a cyclist who cut in on the wrong side and then to run after the man responsible for for this breach of regulations. Immediately the traffic was a jumble again.

Efficiency of the American Military Police in handling their traffic during the war made a tremendous impression not only upon the French but upon other Europeans who saw how well it worked out. Where the other armies were repeatedly running into jams and tyups, the American S. O. S. functioned with a great deal less confusion, due to the fact that while the Americans may not have been as well trained in a military sense as the other armies, they had from their civil lives learned traffic regulation such as was necessary in handling the tremendous column of traffic over the roads back of the lines.

The great trouble in Paris is that the traffic policemen have had no training. One of them admitted to Maj. Robertson that his only instructions were to prevent accidents. He knew nothing about the rules of the road or how traffic should be handled, and was rather incensed at being given a traffic job, for this is considered to be the most difficult in the service. There is nothing wrong with the regulations in force in Paris, but there is everything wrong with the way in which they are applied.

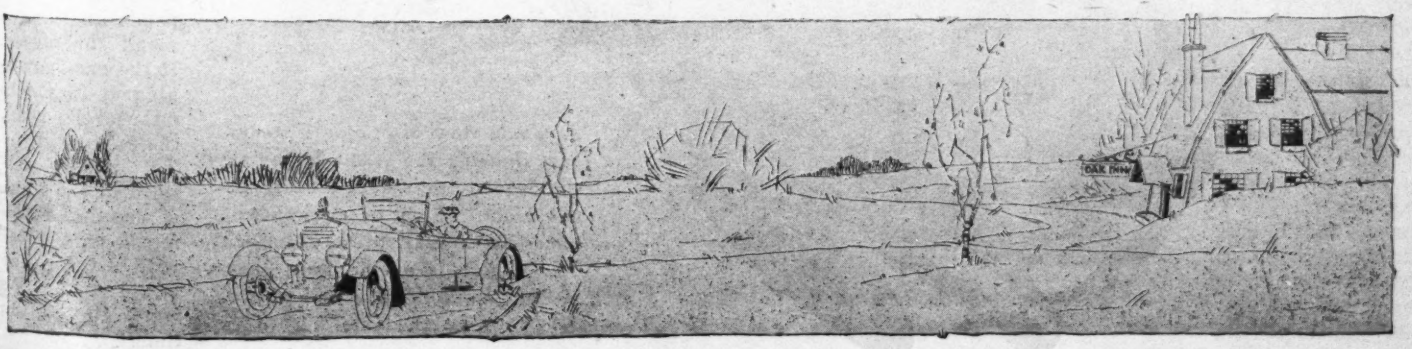
Until special traffic police are formed and given thorough instructions in the handling of traffic, conditions cannot improve. Some of the officials in the Traffic Department are in favor of modern methods being applied. They would like to see a special traffic squad created and to incorporate in it only men who had been given thorough instruction in the handling of traffic. Others remark that Paris has managed to get along without any special traffic police for a few scores of years and there is no necessity to make a change now. The policemen, as a whole, dislike traffic work; blowing a whistle appears to lower their dignity and they protest that it hurts their mouth.

Major Robertson, who has given the Paris police this conclusive demonstration, has already had experience in handling traffic in Europe, for during the war he took charge of all vehicle traffic of the city of Bordeaux. At that time, Bordeaux was an important American base.

To Act as Instructors

Americans probably will be called upon by Major Robertson to act as instructors for the French police in handling their traffic problems. It will be a long time before French traffic can be handled along American lines, for not only is it a new experience for the French but before they can really take over the American system they must actually to be educated to think in American traffic terms. Maj. Robertson's venture is, of course, merely experimental in character and will be abandoned if the difficulties prove too great to be overcome.

And incidentally, after Maj. Robertson shall have solved the traffic problem for the French, there will be a great opportunity for him to devote some attention to the problem in other parts of Europe.



New Standard Steam Car

Automatic Controls—High Pressure Condensing Are Features of Car—Operates 300 Miles on One Filling of Water

IT is generally recognized by all engineers that the steam power plant offers a means of readily burning low grade fuels with an ease that has not as yet been approached in the motor car type of internal combustion engine, and we are finding therefore that there is an increased amount of attention and study being given the steam plant and its possibilities; one of the latest entries to the steam car field being the Standard Engineering Co. of St. Louis, bringing out a steam car, on which all controls are automatically operated, it being necessary for the driver to only sit in the seat, press a button, and start off after a thirty second wait.

Scott Steam Car Specifications

ENGINE.....*Two-cylinder double acting*
BOILER.....*Water tube type*
STEAM PRESSURE.....*600 lb.*
FUEL AND WATER SUPPLY..*Automatically controlled*
CONDENSING SYSTEM.....
.....*Gives 300 mile operation on one filling*
FUEL USED.....*Kerosene*

Two-Cylinder Engine

The car is powered with a two-cylinder double acting engine supported at its front end on a cross-member in the frame and at the rear, by the axle. The boiler is of the water-tube type, and its position in the chassis is just behind the radiator, which in this case serves as a condenser, making it possible to use the boiler water over and over again, obtaining about 350 miles per filling.

Following is a description of the car as given by the builders of the car, L. L. Scott and Dr. E. C. Newcomb, St. Louis.

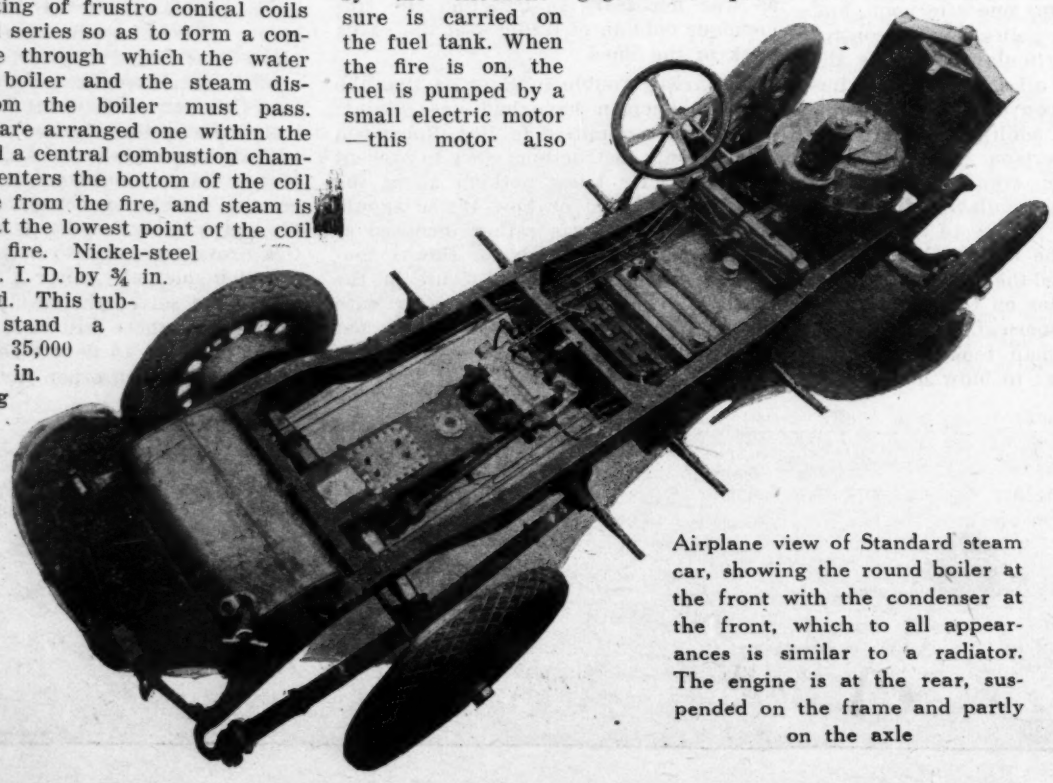
"The boiler is of the continuous flow type, consisting of frustro conical coils connected in series so as to form a continuous tube through which the water fed to the boiler and the steam discharged from the boiler must pass. These coils are arranged one within the other around a central combustion chamber. Water enters the bottom of the coil most remote from the fire, and steam is discharged at the lowest point of the coil next to the fire. Nickel-steel tubing ½ in. I. D. by ¾ in. O. D. is used. This tubing will stand a pressure of 35,000 lb. per sq. in. Freezing does not affect it. All joints—which are very few—are welded. Circulation of water through this boiler is dependent upon action of the water pump, and the velocity of the steam through boiler approximates 450 ft. per second. Owing to this high steam velocity and to the use of defloculated graphite mixed with kerosene for lubricating the engine, scale and deposit trouble have been eliminated. This boiler has about 72 sq. ft. of heating surface and can produce 500 lb. of steam per hour, at an average efficiency of over 80 per cent. The car will run one mile on the stored steam in the boiler, after the fire has been shut off.

Combustion System

"We use kerosene fuel, which is ignited cold by an electric spark. The spark plug circuit after two seconds operation is cut off by a switch operated by the kerosene gage. No pressure is carried on the fuel tank. When the fire is on, the fuel is pumped by a small electric motor—this motor also runs the water pump and air blower—to a mechanical atomizing nozzle and is discharged in a very fine spray at 35 lb. pressure, and directed downward from the top of the boiler into a combustion chamber. This chamber is entirely surrounded by pipe coils. In a fire of the atomized type, it is necessary to have a long space in which to burn the fuel. Great difficulty has been experienced by others in the past with refractory linings breaking down under this type of fire. It is also necessary to complete combustion before the fire touches the boiler tubes or sooting will take place. With the combustion chamber as shown in the cut, the fire cannot play on any coil, the heat is gradually absorbed over a large area, with the result no trouble is experienced in burning boiler coils or breaking down refractory lining.

Method of Control

"Great difficulty has been experienced with the continuous flow of type of boiler (in motor car use) in maintaining an even pressure and temperature; pressure and temperature were either too high or too low which lead to burnt boilers, burnt-out packing, and irregular running of the car. Control systems of the past included numerous by-pass valves, steam automatics, flow motors, etc. Our control consists of a steam gage which operates an electric switch; said switch controls the operation of an electric motor. As the water and fuel pumps are driven by an electric motor these liquids are pumped in definite quantitive relation. The length of time that the motor is 'on' depends on the demand for steam. If the car is running at 25 m.p.h. on level road, the motor will be 'on' about one-third of the time. If running at 60 m.p.h. on a level road the fire would then be "on" all of the time.



Airplane view of Standard steam car, showing the round boiler at the front with the condenser at the front, which to all appearances is similar to a radiator. The engine is at the rear, suspended on the frame and partly on the axle

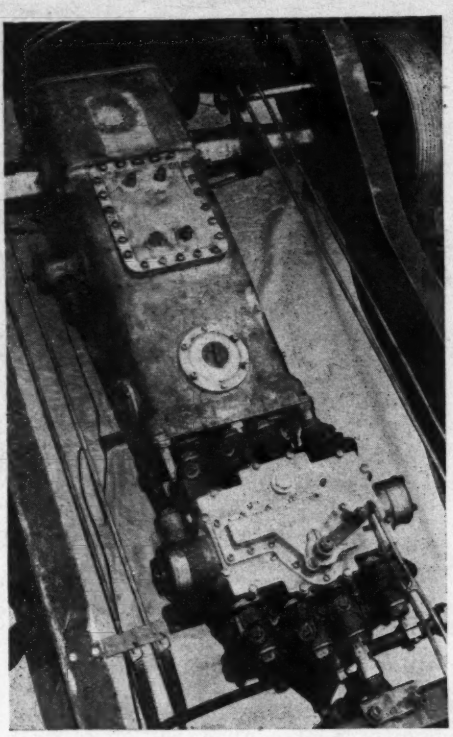
It is a very easy matter to see the advantage of using an electric motor of constant speed in place of driving the pumps from the engine. This drive also has the advantage of locating all parts containing water, right at the boiler. By driving the water pump by electric motor, it is not necessary to use a cushion in the water line to prevent water hammer. We also eliminate the safety or blow-off valve by a fuse in the motor circuit.

The starting and stopping of the motor is controlled by the steam pressure gage. This gage operates a small switch which is set to open the circuit at 600 lb. steam pressure and to close the circuit when the steam pressure has dropped to 500 lb. It is absolutely necessary to break the circuit at one steam pressure and close the circuit at a lower pressure.

Steam Temperature Control

The back of duplex gage is shown in the cut. Small pins are attached to the Bourdon tubes of these gages, which project out through the back of the gage and operate the small electric switches. The kerosene gage controls the time of operation of the spark plug. This circuit is closed from 0 to 25 lb. pressure and open above 25 lb. pressure. The normal pressure on delivery side of fuel pump (when motor is running) is about 35 lb. To avoid handling the motor circuit, we use a magnet switch which operates in the motor line. The magnet switch takes half an ampere to operate it and this is the current carried by the gage switch. A steam temperature gage is used to indicate the temperature of the steam, which runs from 600 to 750 deg. F. This gage has an electric switch which closes at 800 deg. F., at which time the fuel will be automatically cut off from the combustion chamber. The closing of this switch causes a little magnet by-pass valve in the fuel line to open. This switch seldom comes into action in the normal working of the system, but it is a safety means to shut off the first in the event that the water tank is empty.

"As common with most gas cars, we use an electrical motor, a storage battery and a dynamo; our motor and dynamo are connected in series. The dynamo furnishes all of the current to the motor direct, when the motor shuts off, due to pressure being up to 600 lb., the series field of the dynamo is automatically cut out, thereby reducing the dynamo output to a current suitable for charging the battery. For tractor work —where the speed of the engine is nearly constant—it is possible to eliminate the dynamo, motor and storage battery, but it is necessary to have hand-starting devices, a dry battery for ignition and control of small magnets which act on suction valves of pumps. We feel that the motor and storage battery is the most direct and simple arrangement.



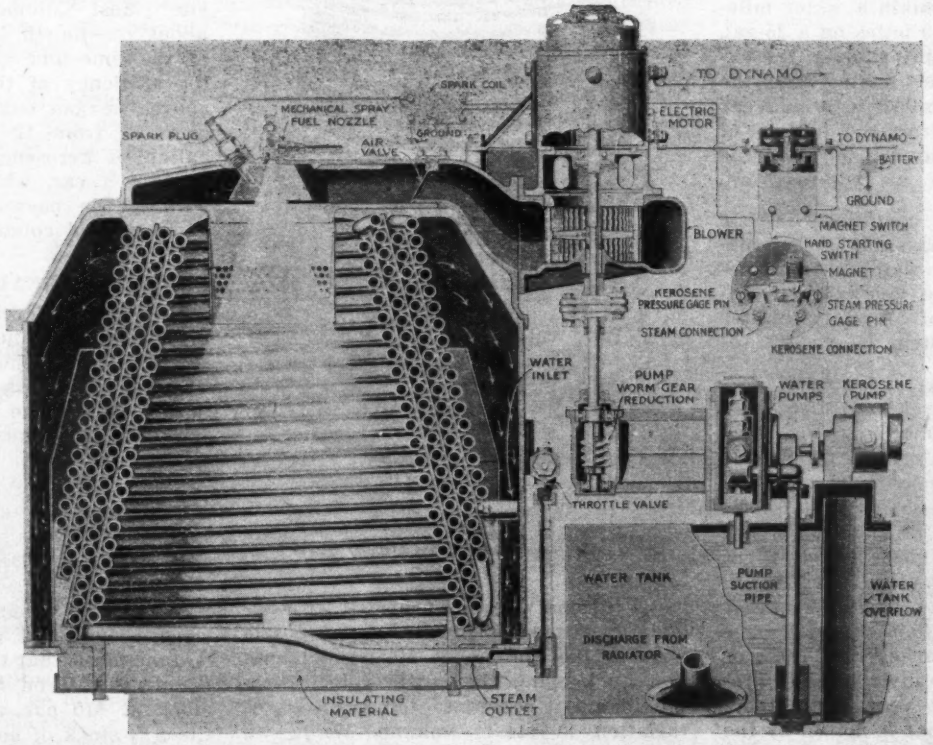
The engine of this steam car has two cylinders. The double acting principle is used together with poppet valves

Throttle Valve

"The throttle valve is made of non-rusting material. Steam cannot pass the seat of the valve until the valve seat has a full opening, thereby preventing wire drawing which tends to destroy the valve seat. The throttle valve will close automatically when the brake is applied.

Water Pumps

"One of the sources of trouble, on automotive steam systems of the past, was the water pump. The valves on our water pump are made of special non-rusting material that has very long life. The lift of the valve is limited to 1-16 in. Due to small lift and special design of the valve and to the fact that the pump always runs at the same speed regardless of the speed of the car we absolutely eliminate all pump noises. As our pump has practically no clearance space it cannot get air-bound. We use no stuffing-box whatsoever and the entire pump is inclosed in a case and submerged in oil. The pump plunger is made of hardened stainless steel; it is so designed that there can never be any sidethrust on it or the pump cylinder and consequently there is absolute alignment at all times. By making the pump cylinder long and making the bore absolutely round and straight, and no possibility for wear of plunger or cylinder, we avoid the use of stuffing-boxes and get a minimum amount of friction between plunger and cylinder. Our pump does not leak. It may be interesting to add that these pumps have been built to work successfully against 5000 lb. pressure although our pressure never exceeds 600 lb. The engine of the Standard steam car is of the semi-uniflow two cylinder double acting, poppet-valve type. Valves and piston rods are made of non-rusting material. The valves never need to be reground. The metal in the cylinder is absolutely uniform in section, so as to insure even expansion of the metal when hot. The cam box, which carries the cam and tappets for operating the valves, is thoroughly insulated from the cylinder to avoid heating of the oil in the cam box. Different points of 'cut-off' and reverse are obtained by simply shifting the



The steam boiler is composed of a number of sections of steel tubing built up into the shape of a cone

cam. The cam is of special shape to permit easy shifting and to allow an infinite number of cut-offs.

Low Steam Consumption

By the use of short cut-off, tight valves, small clearance space, free exhaust, uniform section in cylinder metal, we get very low steam consumption. The mechanical efficiency of our engine is about 95 per cent. We use no stuffing-boxes on valve-stems or piston rods; it is simply a question of proper non-rusting material, proper design and workmanship and means to maintain perfect alignment. In passenger cars we mount the engine partly on the rear axle and partly on the frame; the major part of the weight is carried by the frame. The unsprung weight on the axle is very small. By this drive we eliminate the driveshaft, and universal joints and get a smooth-riding job.

Pleasure Car Differential

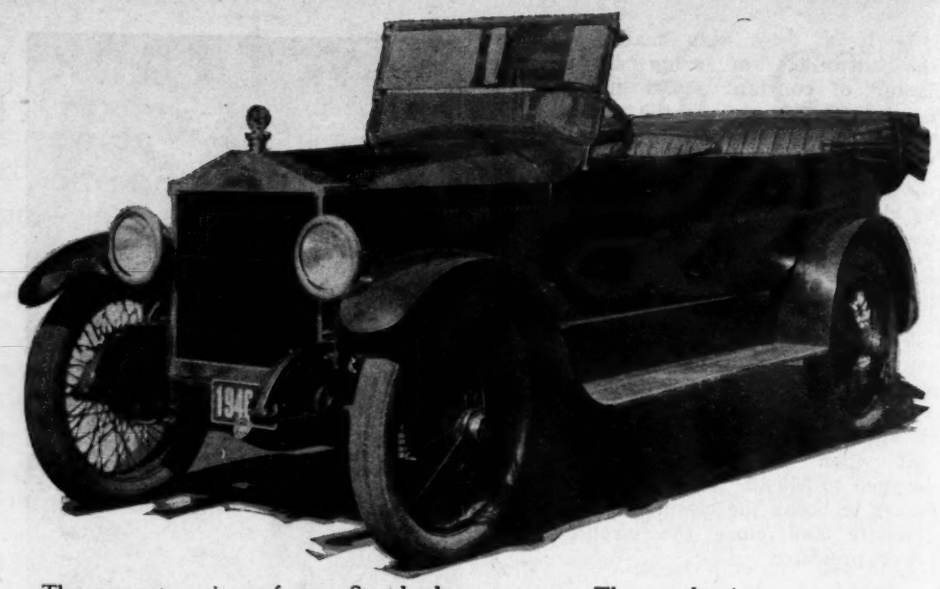
"Where the engine is mounted partly on the rear axle and partly on the frame, we carry the differential spur gear in the engine case, which case is an aluminum casting very carefully designed to take care of all conditions of the service. There are many unique features in our differential. The principal one being the means of adjusting the differential spur gear to the engine spur gears. This adjustment is brought about by having the bearing for the axle mounted in the aluminum frame on an adjusting axis of rotation, eccentric to the axis of the axle. This arrangement allows a very fine adjustment between the engine driving gear and differential gear and maintains concentric alignment of the entire axle.

Condensing System

"It is possible to obtain a water mileage of from 100 to 350 miles on a 25-gal. tank of water by simply running the exhaust steam from the engine into the top of a radiator similar to a gas car radiator and connecting the bottom of the radiator with the water tank, this without the use of a radiator fan.

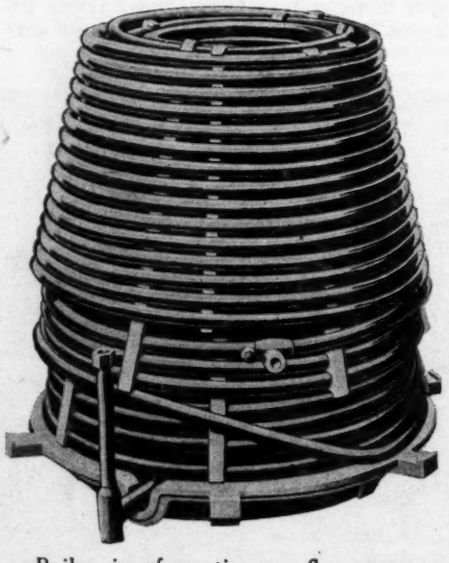
Weather and road conditions greatly affect the water mileage. It is very desirable to get a long water mileage because aside from the general convenience the amount of foreign matter brought into the system is greatly reduced.

Long water mileage will also permit the use of alcohol in the water to prevent freezing in cold weather. One of the first things to look after in this matter is to have an engine that is efficient. The efficiency of the engine not only saves fuel and water but it regulates the size of the boiler, etc. The exhaust steam from the engine must be properly distributed at the top of the radiator and the discharge from radiator to water tank must be distributed to prevent noise. It is also very desirable to have a radiator fan that is driven by the exhaust steam from the engine. If we drive the fan from the engine mechanically it will not do very much good on long hills or on heavy pulling where the car is moving slow and the steam consumption is large. The ordinary exhaust turbine will not do for this work on account of the constantly changing load.



Three-quarter view of new Standard steam car. The condensing system gives 300 mile operation on one filling of water

If the turbine nozzles are set so that the turbines will run at average road speeds, when we run at higher speeds or in heavy pulling, the back pressure on the exhaust line will be so high that the engine horsepower will be materially reduced. If the nozzle area is set to keep down the back pressure, the turban will not run except in very heavy going. We have experimented with an exhaust actuated turbine which is provided with automatic means for increasing the nozzle area as the volume of steam increases thereby keeping the steam velocity approximately constant irrespective of variation in steam volume. While we have obtained some very interesting results in condensing steam, we have not as yet completed our experiments in this and therefore we would prefer to withhold information on this until a later date.



Boiler is of continuous flow type, consisting of frustro conical coils

Comparative Efficiency

It is probably not generally known that a properly designed automotive steam plant using steam at 600 lb. pressure and 700 deg. F. temperature, has a total efficiency at the rear wheels of around 15 per cent. or more. While this is slightly below the full load efficiency of the average gasoline power plant, it must be kept in mind that the efficiency of the internal combustion engine is at its maximum only at full engine power.

This is not true with the steam engine in fact the steam job is almost the opposite. Most automobile engines run at about one-fourth load the greater part of the time and under these conditions the efficiency of the steam job is way above the gas engine plant. We have obtained from 12 to 15 miles from a gallon of kerosene with seven passengers in a car, which weighed 4200 lb. without the passengers, and this over average road conditions.

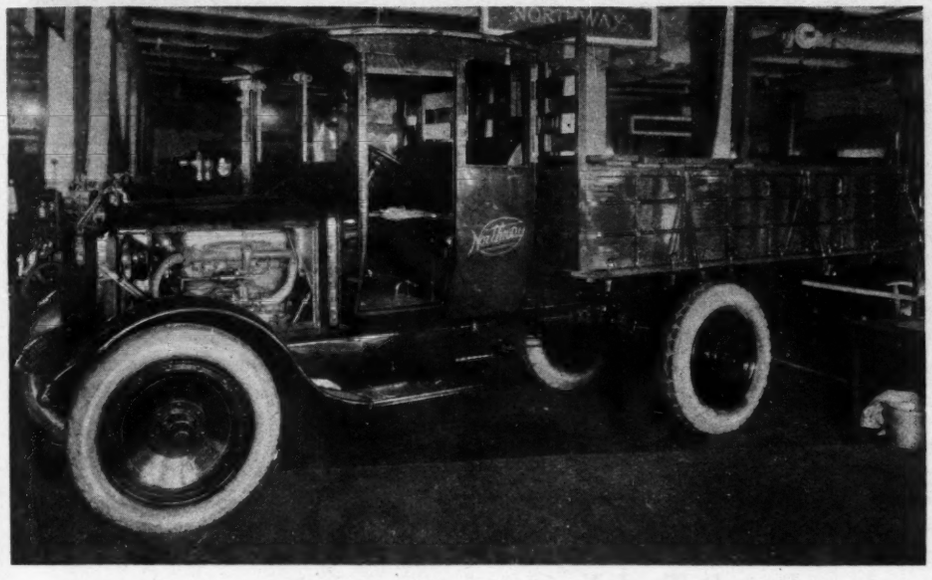
DENBY TO HEAD FULTON TRUCKS

New York, March 11—At the auction sale to-day conducted by the receiver, stockholders of the Fulton Motor Truck Co., of Farmingdale, L. I., combined with Garvin Denby and other financial interests purchased the factory and property for $290,000.

A new company to be known as Fulton Motor Corp. and to be headed by Denby, who was president and general manager of the Denby Motor Truck Co. of Detroit before its reorganization a year ago, is being formed with Denby as president and general manager. It is announced that the capital of the new company will be $1,500,000 of Class A stock at $10 par value and $350,000 of Class B stock of no par value. Through ownership of a majority of the Class B stock Denby will have control.

New Northway Truck Announced

Made by the Builders of the Northway Engine—Novel System of Chassis Lubrication Used



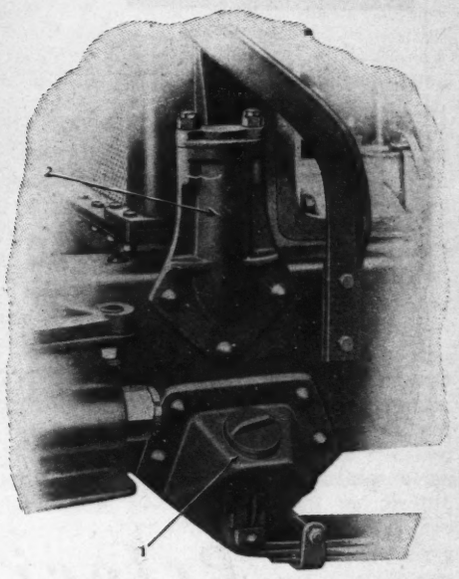
Three-quarter view of the 3½-ton Northway truck exhibited at the Boston show

INTRODUCED at the Boston show, the Northway truck, manufactured by the builders of Northway engines represents the latest improvement in truck construction known in the field of commercial vehicle building. The Northway truck line is represented by a 2-ton and a 3½-ton chassis both of which use the same four-cylinder engine having a 4 in. bore and a 6 in. stroke with the valves located in the detachable head. A four-speed transmission is employed on both chassis models and an efficient and unique oiling system is used to lubricate the chassis.

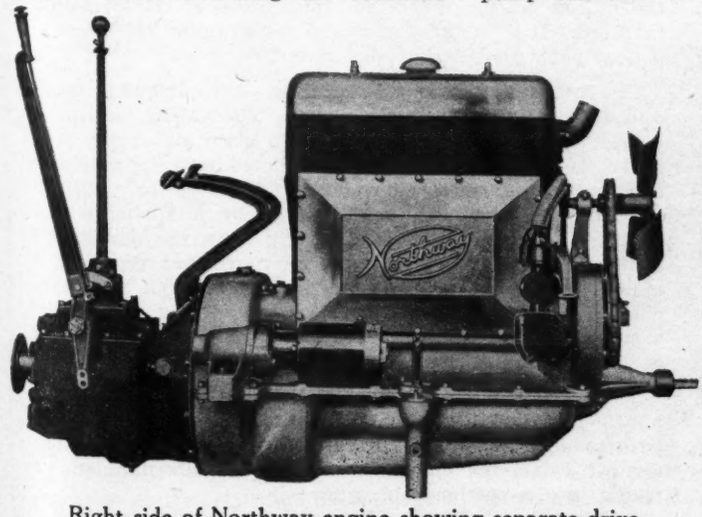
Four units comprise the engine construction. These are: the detachable cylinder head containing the overhead valves, the cylinder block bolted to the crankcase and the upper and lower section of the crankcase. The upper half of the crankcase forms a supporting section of the whole engine. Three point suspension brackets and supports for the crankshaft bearings are all contained in this section. A silent chain drives the camshaft and the pump and generator shaft. An easily accessible compensator is fitted that allows for adjustment of the silent chain. A feature in connection with the drive of the water pump is the quick detachable coupling between the water pump and the generator. This coupling can be disconnected in a few moments time and the whole pump can then be lifted from the engine; the same is true of the generator.

The lubricating system employed in the engine is most complete. A gear driven geared pump forces the oil through the hollow crankshaft to the main bearing and to the crankpin bearings. The oil leads which direct the oil to the various passages are cast in the crankcase. All leads are so arranged

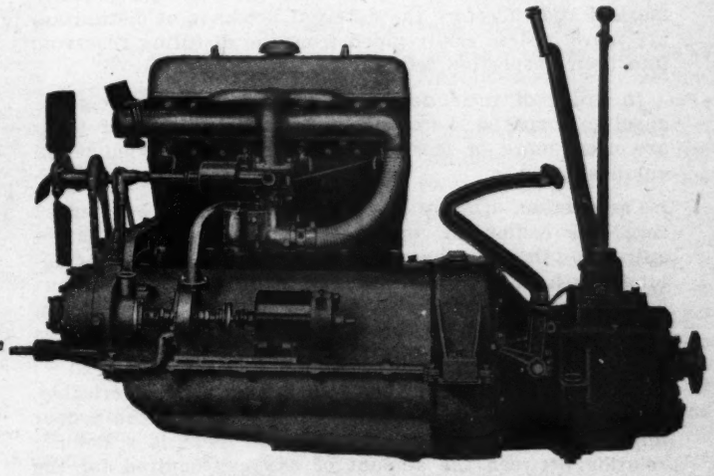
(*Continued on page 61*)



Chassis lubrication is by cast-in reservoirs as the illustration shows at 1. The small plug is removed which enables the operator to fill the reservoir and at the same time inspect the wick feed which supplies oil constantly to the shackle bolts and spring leaks. 2 shows the housing for the spring that suspends the radiator



Right side of Northway engine showing separate drive for distributer. The oil filler location is adjacent to the sight oil indicator, a convenient arrangement. Note the large removable plate which exposes the valve push rods and tappets



Left side of Northway engine showing the unit power plant. The engine is of the overhead valve type. Note the air heating stove cast integral with the exhaust manifold

Standard Mechanical Operations in Tractor Service

by John Charles Thorpe, M.E.
and Gustav Howard Radebaugh

EDITOR'S NOTE: The two pages herewith are the ninth of a series covering the service operations on tractors, although the same can be applied quite generally to passenger car and truck engines. In last week's issue of MOTOR AGE we told of the operation necessary to correct the troubles caused by dirty firing points in the breaker or interrupter. This installment deals with the carbureter. The fuels used, principles of carburetion and carbureter construction. It is often the case that the more simple a trouble may be the more difficult it is to locate. It is with this in view that we present this series which deals with the everyday problems that may confront the tractor owner and tell here how to locate and remedy these troubles.

PART IX

Principles of Carburetion

The Fuels.—The fuels used in internal combustion engines,—the broad classification that comprises all so-called gas engines of whatever character,—are liquids that are secured from the distillation of crude oil or petroleum.

In the ordinary process of disillation the petroleum is put into a tank or reservoir and heat is then applied to it Naturally, that portion of the crude oil that is most volatile, or in other words, that is easiest to vaporize, must of course separate itself first as the heat is applied.

On account of its volatile nature these first products are the most easily ignited and therefore become most useful as fuels for the development of power. It is interesting to note that the degrees of volatility are quite easily marked and therefore the different products of distillation are more or less easily piped from the distilling reservoir into their respective receptacles.

In order of their degrees of volatility such fuels are gasoline, naphtha, kerosene, and distillate. All of them are used, more or less, as fuels for internal combustion engines.

Carburetion.—One of the first principles to be learned regarding combustion or the kindling of fires, is the requirement that a certain amount of oxygen must be combined with any kind of fuel to make it burn. It thus becomes necessary to have a means of securing and mixing oxygen with the fuel which it is proposed to use in the gas engine before power can be developed.

The only source of oxygen that is available, practicably, is the air. Thus, the problem to be solved is the proper mixture of air with the fuel because there is a definite relation between the amount of oxygen required for the burning of certain kinds of fuel. For this purpose the carbureter is used and the process of mixing is called carburetion. It is not difficult to trace the origin of this word if it is understood that the carbon content in the fuel is the element that mixes with the oxygen during the process of burning or combustion.

The Carbureter.—It will be understood from the foregoing discussion of carburetion that it is nothing more nor less than a mixing process and that the carbureter is a mixing device. This important instrument consists, essentially, of five parts, namely,—the air intake, a fuel intake, a mixing chamber, an outlet for the mixture, and a compensating device or fuel control.

The basic principle of carbureter design and construction is the same, but there may be a great variation in the means employed for the application of the principle involved. It is in the design and construction of the component parts that carbureters differ.

The intake of fuel to the engine is accomplished through a device called the needle valve. The intake of air is usually accomplished first through a main air supply pipe that leads the air by an unobstructed passage into the carbureter; secondly,—there is what is called the auxiliary air supply valve usually controlled by a spring which operates to introduce more air only when the demand of the engine which is called upon for more than the normal amount of power, exceeds the supply through the main channel. Sometimes the main air supply is fitted with some sort of regulating mechanism which thus eliminates some constructive details.

The mixing chamber is in reality, the body of the carbureter, of such, interior construction that, as the fuel is introduced through the needle valve and the air through the air valve, the currents of each are intermingled, or mixed into a combustible vapor.

It is clear that some force is necessary to carry on these processes and this is supplied by the vacuum created by the out-board motion of the pistons in the engine, or in more common terms, the suction of the engine.

Above the mixing chamber the body of the carbureter is formed into a suitable outlet so that the mechanical work necessary to attach it to the engine may be easily accomplished. This is usually done by the formation of a flange which is bolted to a similar flange on the fuel supply pipe which connects the carbureter with the intake manifold on the engine.

The compensating, or fuel controlling device of the carbureter, is called the float, and the part of the carbureter containing the float, the float chamber. The float itself is made circular in form and may be either constructed of cork, thoroughly shellacked, to prevent the absorption of the liquid fuel, or it may be a hollow float of metal, usually sheet brass.

The float is set in the float chamber and so connected with the float valve that its relative level position in the float chamber controls the opening of the float valve itself. It will thus be clear that if the main fuel supply is connected to the float chamber and proper communication is made with the needle valve that the rising and falling of the float will regulate the amount of fuel passing into the mixing chamber.

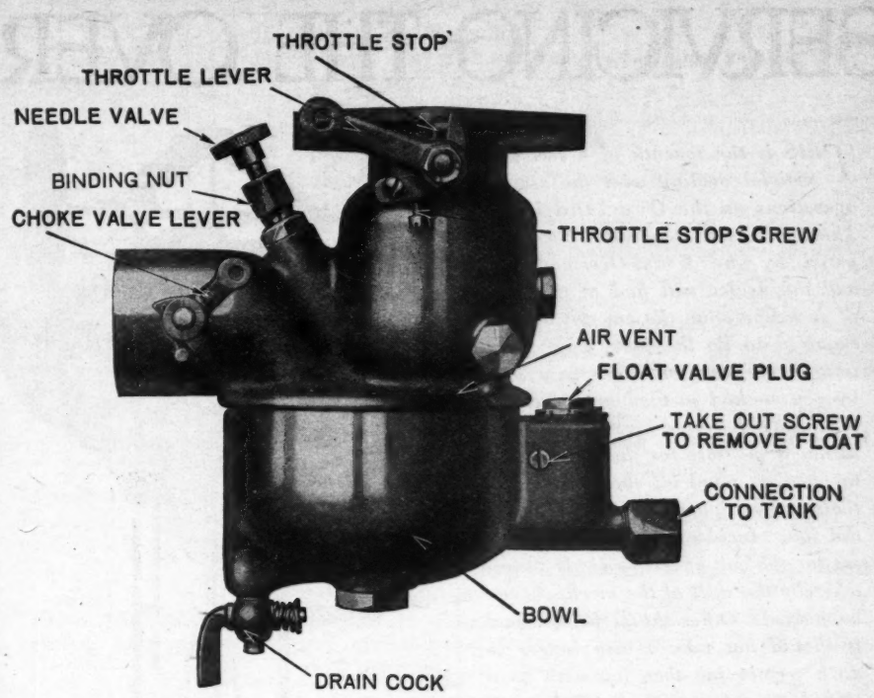


FIG. 1

Figures 1 and 2 show the external appearance and the interior construction of a typical tractor carbureter.

By reference to Figure 2, the control of the fuel supply is made clear. Gasoline enters through the fuel line as indicated by the arrows, passes through the float valve, filling the float chamber to a level determined by the float adjustment. It then passes through the needle valve into the mixing chamber, where it meets the air supply and is mixed with it. A properly balanced secondary or auxiliary air valve here controls the amount of air to be used.

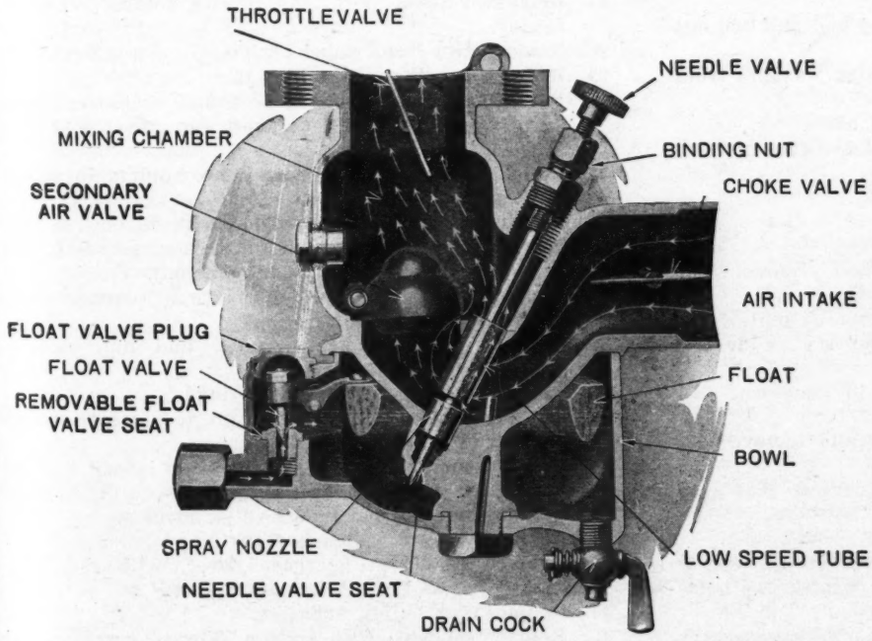
The throttle valve at the top of the carbureter regulates the fuel supply to the engine and is controlled by the operator.

It will thus be seen that while the principle involved in carburetion is simple enough, the processes involved are quite complex and require an instrument of more or less delicate construction and refinement in operation.

When the engine fires intermittently, will not start, or when under load, will not develop its customary power, it is frequently because of improper carbureter adjustment. The adjustment of the needle valve may be such that too much fuel passes, producing what is called a too "rich" mixture. It is indicated by sluggish action of the engine which seems to be smothered.

On the other hand, too little fuel may be passing the needle valve, giving a too "lean" mixture. This is indicated by the "coughing" of the engine. It is thus clear that a mixture should be as lean as practicable to give the greatest degree of fuel economy.

A too "lean" mixture is sometimes produced by a particle of dirt or foreign matter of some sort getting under the needle valve, thus restricting the passage of the fuel. Ordinarily this obstruction may be removed by racing the engine a little.



SECTIONAL VIEW OF CARBURETER

FIG. 2

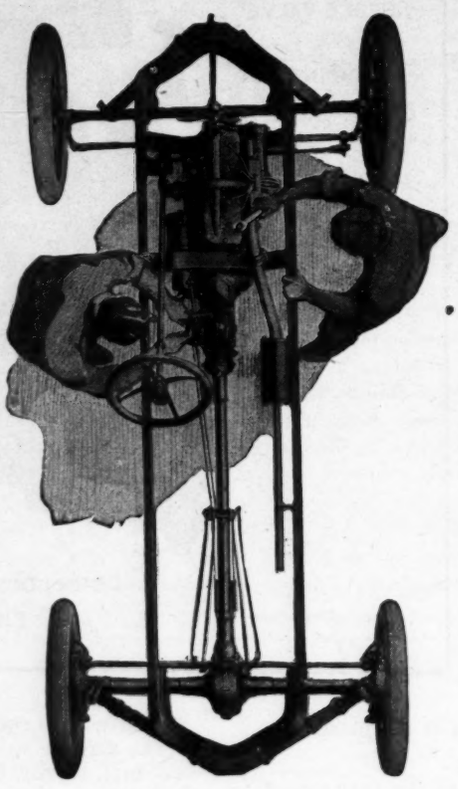
NEXT WEEK—

Engines misses or fails to start caused by incorrect carbureter adjustment.

How to locate the trouble and attain correct mixture.

SERVICING THE OVERLAND FOUR

THIS is the seventh of a series of articles dealing with the service operations on the Overland Four. The work as it stands has been prepared by the Willys-Overland Co., and the dealer will find at the head of each operation the amount of time required to do the job. The operations have been put down in a step-by-step method so that one operation is logically followed by the next. This makes it possible for the service man to have on hand all the necessary tools and equipment before beginning the job. Incidentally the time limit set for the job affords a ready means whereby the skill of the mechanic can be judged. Other things being equal it should not take a man longer to do a certain job than herewith mentioned, as the service department of the factory has established these limits after much experimenting. Dealers who are not keeping copies of MOTOR AGE on file are suggested to do so to get the benefits of this series.



PART VII—The Engine

THESE valuable articles—Servicing the Overland Four—will run serially each week until the service operations on the entire car have been explained. This week deals with the

Engine

Next week will be a continuation of the service operations on the engine.

Keep a file of MOTOR AGE for ready reference. The flat-rate system of estimating on a job has been proved the best plan to make your service work more profitable, eliminate complaints and please your customers. The time given here for each service operation can be adapted to the flat-rate system of estimating cost of repair jobs on cars of this class.

TO REMOVE AND REPLACE PUSHROD OR CAMSHAFT

Time: 2 hrs., 20 min.

1. Remove hood.
2. Drain radiator.
3. Remove front splasher by removing one 5/16-in. cap screw, two 3/8-in. cap screws, and two 1/4-in. stove bolts.
4. Disconnect battery cable at battery. Disconnect wires from lamp sockets and pull wires through shroud.
5. Remove radiator shell.
6. Remove 5/16-in. not on radiator stay-rod and pull rod out of radiator bracket.
7. Remove 5/16-in. bolts, with nuts and lock washers from crankshaft bracket.
8. Remove 3/8-in. radiator holding-down bolts.
9. Remove one 5/16-in. cap screw with lock washer from lamp stay-rod.
10. Loosen hose clamps on radiator hose.
11. Remove radiator.
12. Drain oil from oil base.
13. Loosen two front engine bolt nuts and remove front splash pan.
14. Drive out pin from fan pulley and remove pulley.
15. Remove three 3/8-in. cap screws and six 5/16-in. cap screws from gearcase cover.
16. Remove gearcase cover, and screw in generator cap screw to hold generator.
17. Remove cotterpin from cam gear nut and remove cam gear nut and washer.
    Before removing cam gear, line up gears so that gear marks register with each other.
18. Pull camshaft gear with gear puller.
19. Remove oil base taking out sixteen cap screws holding oil base to engine base and eight 3/8-in. cap screws holding oil base to transmission case.
20. Remove distributer cover. It is absolutely necessary when removing intake manifold not to remove exhaust manifold. Front and rear yoke should be loosened and then turned to clear intake manifold, and drawn up tight to hold exhaust manifold in place so that gaskets are held in place to facilitate reassembly.
21. Remove center manifold yoke.
22. Remove intake manifold.
23. Remove both valve chamber covers.
24. With valve lifter, lift each valve spring and block up with 1 5/8-in. by 1/2in. by 1-in. wood blocks as in Fig. 14.
25. Remove oil drain plug in oil pan.
26. Remove eight bolts from transmission case holding oil pan to transmission case.
27. Remove sixteen 5/16-in. cap screws holding oil base to engine.
28. Remove two front camshaft bearing cap screws.
29. Remove bearing, as in Fig. 15.
30. Remove camshaft; it will be found necessary to push valve tappets up so that shaft can be removed. See Fig. 16.
31. Replace pushrods—one at a time, holding in place by moving camshaft to rear.
32. Replace front camshaft bearing with oil hole at top.
33. Put in bearing cap screws and tighten securely. Make sure that Woodruff key is in camshaft.
34. Replace camshaft gear, being sure to register all gear marks with each other.
35. Replace camshaft gear washer and nut, tightening securely, and cotterpin.
36. Remove blocks under valve springs.
37. Replace intake manifold. Be sure to place all manifold gaskets in proper position .
38. Replace center manifold yoke. Then loosen end yokes and place in position, tightening securely. Remove wooden blocks from under valve springs.
39. Replace valve chamber covers.
40. Replace reduction gearcase cover, with three 3/8-in. cap screws and six 5/16-in. cap screws.
41. Replace fan pulley and pin.
42. Replace oil base with sixteen 5/16-in. cap screws in oil pan to oil base and eight 3/8-in. cap screws to transmission case.
43. Replace front splash pan.
44. Replace radiator.
45. Replace radiator holding-down bolts.

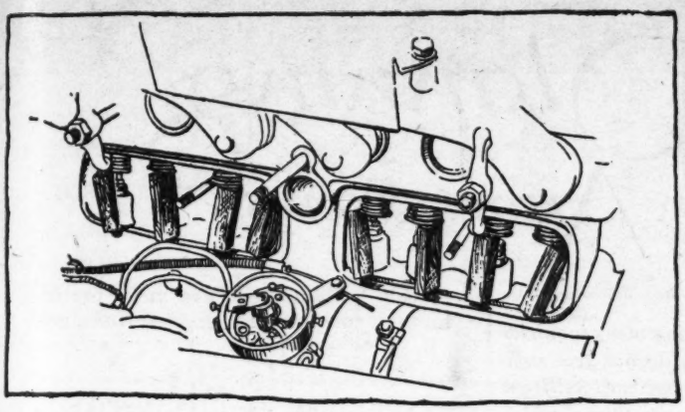


Fig. 14—Blocking up valve springs to remove push rods

46. Replace starting crankshaft bracket, bolting bracket to radiator.
47. Replace radiator stay-rod with nut.
48. Replace lamp wires through shroud.
49. Place front splasher in position.
50. Replace radiator shell, putting lamp wires through shell and connect front lamps. Also connect battery cable at battery.
51. Line up holes in radiator shell, splasher, and frame and put in two ⅜-in. cap screws, one $\frac{5}{16}$-in. cap screw and two ¼-in. stove bolts.
52. Tighten hose clamps.
53. Fill radiator with water.
54. Put one gallon of oil in oil base.
55. Tune up engine.
56. Put on hood.

TO REMOVE AND REPLACE CLUTCH OPERATING FORK

Time: 2 hrs., 15 min.

1. Take weight of car off rear springs with chain falls or crane.
2. Remove cotterpins from rear axle spring bolt nuts.
3. Remove spring bolt nuts.
4. Drive out spring bolts.
5. Remove brake rod from brake pedal by removing cotter and clevis pins.
6. Disconnect hand brake rod from hand brake lever by removing wing and adjusting nut.
7. With proper blocking, raise torsion tube and roll out rear system.
8. Unhook accelerator spring.
9. Unscrew accelerator button.
10. Remove clamping bolts holding clutch pedal pads to pedals and remove pedal pads.
11. Disconnect speedometer cable at speedometer head.
12. Remove floor boards.
13. Remove clamp bolt holding clutch pedal to clutch shaft and remove pedal.
14. Remove clutch shaft Woodruff key.

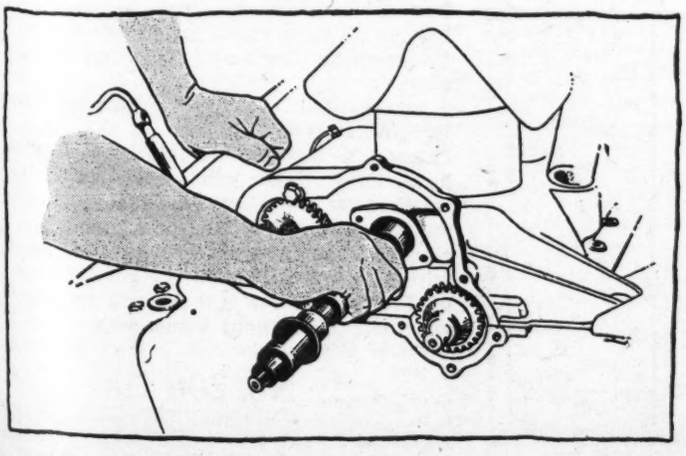


Fig. 16—Removing camshaft

15. Pull off brake pedal.
16. Remove nuts and lock washers holding gear shift housing to transmission case.
17. Remove gear shift housing.
18. Drain oil from transmission and clutch housing by removing drain plugs.
19. Disconnect speedometer cable at speedometer drive shaft end.
20. Block up under transmission.
21. Remove all cap screws holding transmission case to engine base.
22. Remove transmission assembly.
23. Screw in one starting motor cap screw .
24. Remove two nuts and lock washers from each clutch fork bearing stud and pry out bearings.
25. Remove clutch operating fork.
26. Replace clutch operating fork.
27. Assemble bearings in position. Fasten to housing with lock washers and nuts. Remove starting motor cap screw.
28. Assemble transmission on block under car and place in position.
29. Place clutch shift fork between clutch thrust bearing and clutch plate.
30. Put key in clutch shaft and install clutch pedal.
31. Pry clutch pedal forward, which will force transmission assembly in place.

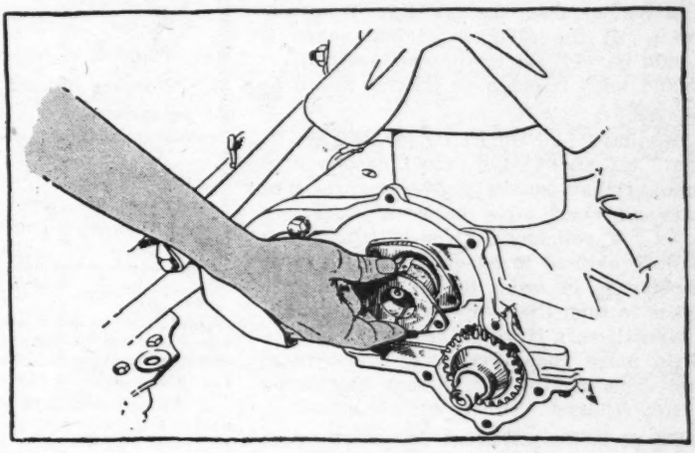


Fig. 15—Taking out front cam bearing

32. Screw in all transmission cap screws holding transmission to engine base.
33. Remove clutch pedal and clutch shaft key.
34. Install brake pedal.
35. Install clutch shaft key.
36. Install clutch pedal, locking to clutch shaft with clamp bolt.
37. Place transmission gears in neutral.
38. Place gearshift lever in neutral.
39. Install gearshift housing.
40. Fasten gearshift box to transmission case with lock washers and nuts. Tighten securely.
41. Roll rear system under car—one man under car steering propeller shaft into universal joint.
42. Lower rear of car so that left rear spring bolt can be installed.
43. Install right rear spring bolt.
44. Put on spring bolt nuts. Draw tightly and cotterpin.
45. Connect foot brake rod with foot brake pedal with clevis and cotterpins.
46. Connece hand brake rod to hand brake lever with wing adjusting nut.
47. Put in floor boards.
48. Connect speedometer cable to speedometer head.
49. Put in clutch pedal pads, clamping to pedals with clamp bolts, lock washers and nuts.
50. Connect speedometer cables at speedometer head and connect accelerator spring.
51. Screw on accelerator button.
52. Fill engine base to proper level with oil.

Garage Planning
Service Station Arrangements

MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquiries are urged in asking for such plans to be used to included the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

No. 203

SALES AND SERVICE STATION

The Wayne Auto Co., Waynetown, Ind., has asked me to present for your consideration a drawing of their plot of ground for a new garage, and request drawings: They wish room for an office, a woman's rest room near the front of the building, men's toilet in the rear, a welding room, and storage room for the largest number of cars possible, with a display room of good proportions for their sales room. They will handle a tractor also.—R. H. Anglemier, Waynetown, Ind.

With an alley alongside your building we cannot see any good reason for sacrificing the space necessary to introduce a driveway into the building from the front. If the alley is in bad shape it would be well worth the expense to pave it and keep it clean so that it would be an asset.

We have laid off 95 ft. for storage as that is about the most economical amount that can be used—four rows of cars with an aisle between each two rows. If you have a row of trucks you will be obliged to offset them with some short cars in order to get enough aisle space to turn them or if you do not handle small cars it would be best to steal a little more space from the show room and shop making the storage section 98 or 100 ft. deep.

There is no provision for stock room but there will be considerable space between the trusses and it might be advisable to build a balcony to hold the stock, this could be over the forward row of cars.

No 204

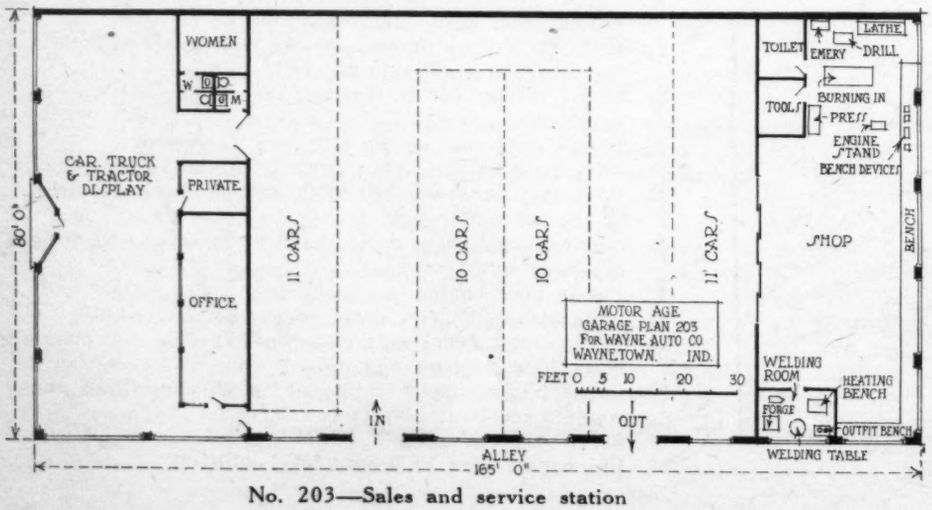
TWO-STORY GARAGE

I am planning on building a two-story, fire-proof garage on a space, 50 by 125, and would like a little help. I want lots of storage rooms and a large work shop. Sales floor to hold about two cars, a good sized accessory department. Which do you consider better an incline or an elevator for placing cars above.

I will sketch out what I have in mind and would like for you to finish or change as you see fit.—P. K. Owen, Frederick, Okla.

A ramp or incline in a building of this size is quite impossible as it takes up too large a proportion of the available space not only in the actual space occupied but in the space made inaccessible. The width of the building is not great enough to run the ramp crosswise and, if it is run lengthwise it cuts out a row of cars on both floors.

The remarks relative to the entrance of garage No. 203 will apply equally well to this building, but are more pertinent in that you have much less frontage.



No. 203—Sales and service station

No. 205

REARRANGED TO GIVE EFFICIENCY

We are inclosing a sketch of our business building as it now is and desire some suggestions as to how it might be changed for more convenient arrangement all the way through, whereby, the business might be more centrally located and ask that you study the diagram and make any suggestion you think would be of any benefit.—Ferguson Motor Co., Pawhusga, Okla.

Your arrangement certainly has need of revamping and we are positive that you will be able to do a great deal more work, store more cars and have much more room to use if you will rearrange your departments in some such way as that we suggest.

The first thing we would do would be to eliminate or close up most of the entrances. It is not necessary to have a car entrance or exit in every conceivable direction and many entrances add to the confusion. The next move would be to centralize and enlarge the show room, office and accessory store. Then the shop activities should all be together; the tire and battery rooms have no business occupying valuable show window and sales space on the main street. The stock keeper can receive and deliver battery and tire repairs over the parts counter.

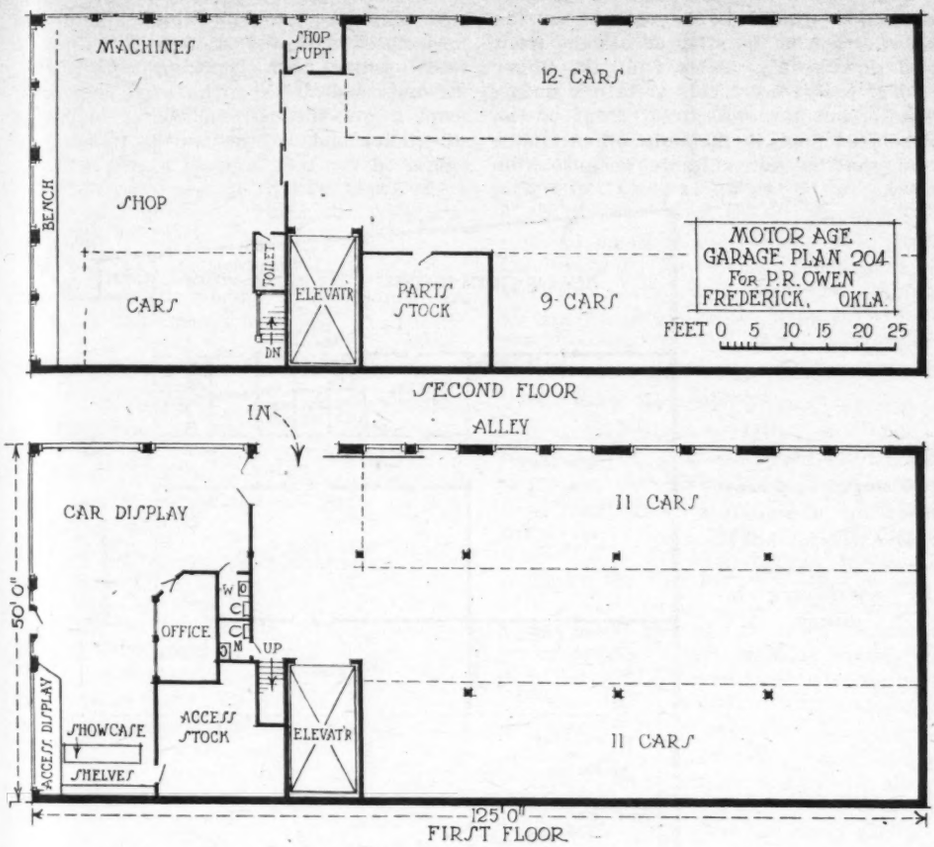
We have made very few changes in your main walls not knowing the construction and fearing that we might disturb the supports of some of the trusses, etc. It may be necessary to leave a post in the center of the show room where the wall has been removed but this will do no great harm.

The women's room seems unusually large and if you have an entrance and exit to your public garage as we show it will be advisable to cut it down slightly. You could retain the single entrance by leaving an open space just inside the entrance so that cars could turn into either aisle.

In regard to routing cars through the building it is always best to have them enter and leave at certain places. We have shown one exit only and it is watched by the clerk who dispenses oil and gasoline. Thus it is unnecessary for storage customers should not be permitted to drive through the service part of the building and it is difficult for anyone to leave without being seen.

No. 206

We are contemplating the erection of a general garage and service station. Before going ahead with our plans we would appreciate your advice and suggestions. And because our proposition is in the for-



No. 204—Two-story garage

mulative stage we ask that you treat it confidentially. Later, if the real estate options are taken up we would be glad to have you publish your plans and advice in the Motor Age.

Our town, though large and growing, has no real garage either in size or service. It boasts of more than 3000 car owners and has many tourists passing through. Taking into consideration the conditions outlined below, do you believe that a real, modern garage would pay?

The garage must be either two or three story and is to be erected on the plot shown. The building need not cover the entire ground area. You will note that the ground is on a hillside and fronts a state highway It is just two blocks from the main business corner of the city. The garage should be large enough to store 100 cars and must provide for our present business, which is outlined below, and our probable future business.

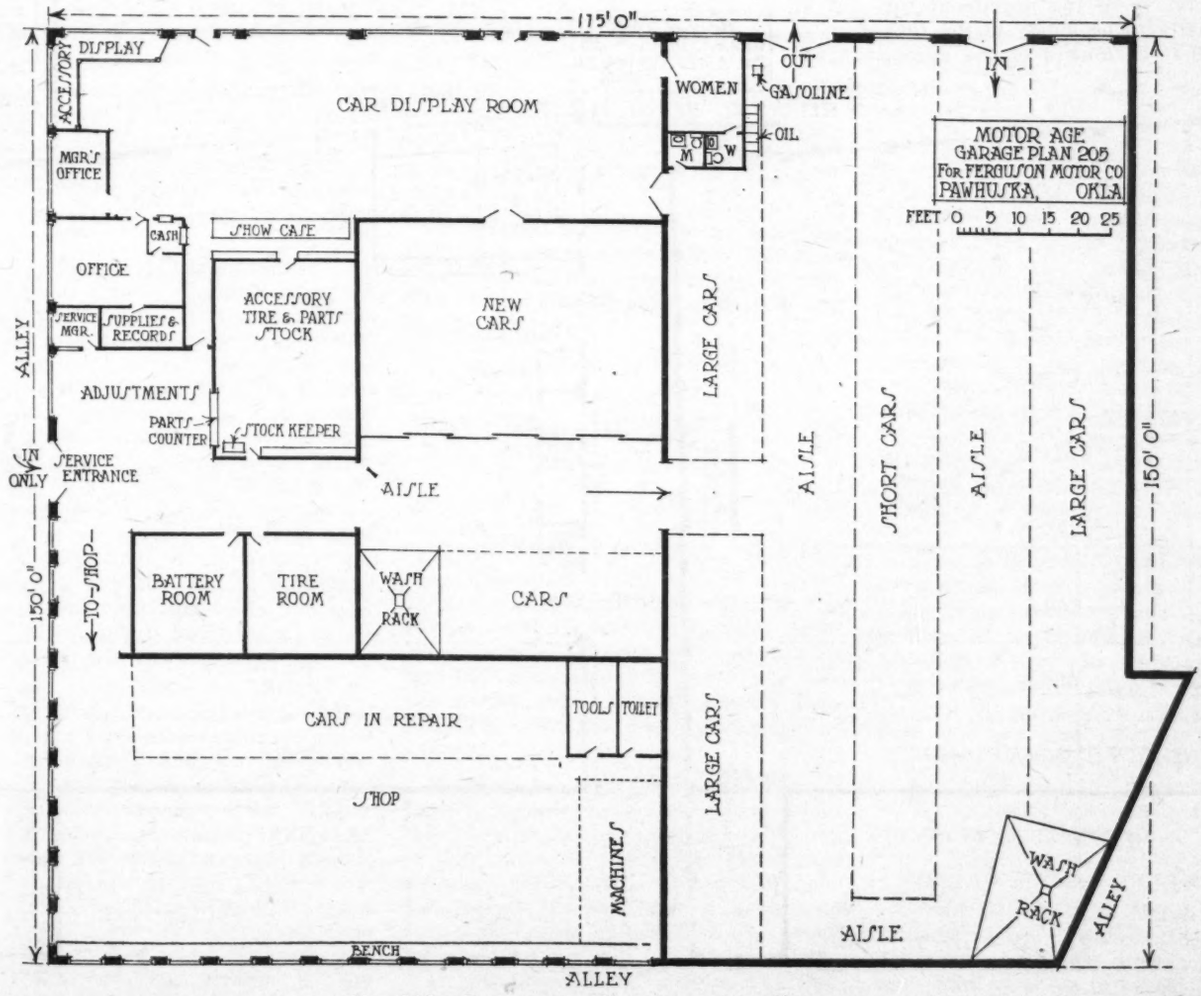
Car Sales: At present we wholesale and retail 250 Maxwell passenger cars and 36 trucks a year. We retail 40 Hupmobiles a year. We also sell a large number of used cars. We expect to put on a third line of cars and probably larger trucks as soon as we build the new place.

Tractor and Airplane Sales: Though we do not handle either of these lines at present, we may do so in the near future.

Tire and Accessory Sales: Our present tire business, both pneumatic and solid, is $50,000, accessories $10,000, and Maxwell parts $15,000 per annum.

Battery Sales: Our present wholesale and retail battery business is over 300 batteries per year.

Service Work: At present we employ 5 mechanics, 1 battery man and 1 washer. With a better service manager we can use immediately 10 mechanics and should be able to develop the general



No. 205—Rearranging layout to give efficiency

repair business to a point where 20 mechanics will be necessary.

The shop will be equipped to take care of all sorts of work, such as welding, reboring cylinders, vulcanizing tubes and casings, etc. We have considered providing space for repair of radiators, fenders, tops and for car painting Gas and oil will also be sold.

Office: In addition to the showroom, space must be provided for offices. There will be one wholesale car man, three or four retail salesmen, one office manager, one tire, battery and accessory salesman, one or two bookkeepers, one or two stenographers and a general manager. As business develops this force will be increased.

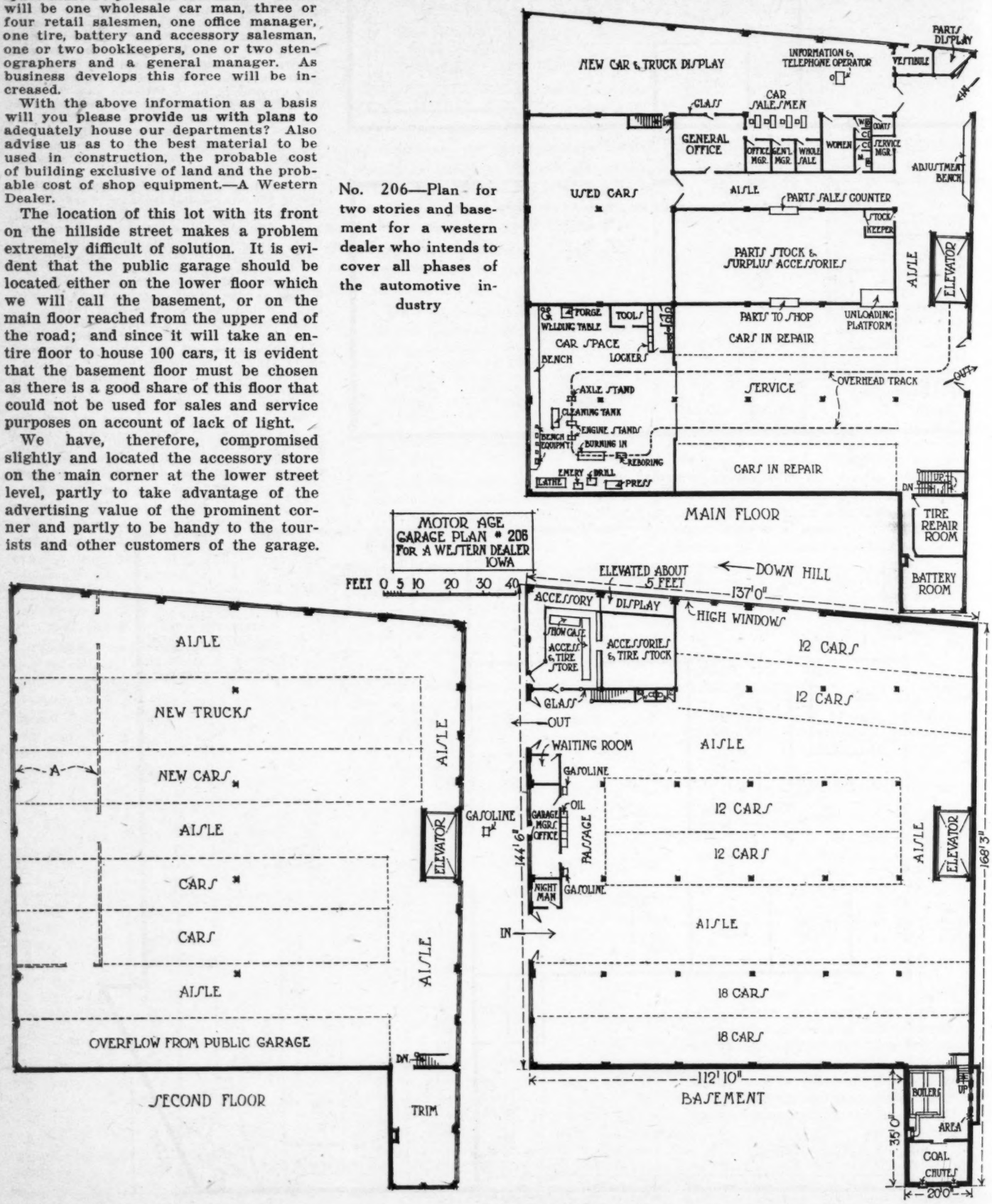
With the above information as a basis will you please provide us with plans to adequately house our departments? Also advise us as to the best material to be used in construction, the probable cost of building exclusive of land and the probable cost of shop equipment.—A Western Dealer.

The location of this lot with its front on the hillside street makes a problem extremely difficult of solution. It is evident that the public garage should be located either on the lower floor which we will call the basement, or on the main floor reached from the upper end of the road; and since it will take an entire floor to house 100 cars, it is evident that the basement floor must be chosen as there is a good share of this floor that could not be used for sales and service purposes on account of lack of light.

We have, therefore, compromised slightly and located the accessory store on the main corner at the lower street level, partly to take advantage of the advertising value of the prominent corner and partly to be handy to the tourists and other customers of the garage.

The only available space for the car showroom which can be viewed from the main street, is the strip across the front and this is only visible from the upper end of the street. This is rather unfortunate, but the side street front of the basement floor is the only other choice and that is not suitable because this floor being mostly dark is no place for the other departments which should be associated with the showroom.

The third floor, you may call it the second, is designed to have no posts except a row through the center to carry the inner ends of the two 68 ft. trusses required for roof support and it will be



No. 206—Plan for two stories and basement for a western dealer who intends to cover all phases of the automotive industry

for the storage of new cars and trucks which can be packed in as necessity requires. This floor will also have to house the overflow from the public garage which will only accommodate 84 cars; when the lower floor has reached its capacity the extras can be run onto the elevator and raised to this floor where they will be stored along the wall convenient to the elevator.

It may be necessary to hold your airplane exhibit on this floor unless you should take the room we have designated for used cars, in which case the used cars would be moved up.

We have been unable to make room for paint and finishing shop on the main floor and if you install these departments, as you surely will, they could be located along the side front as indicated at "A."

Good Service Layout

We are especially pleased with the service layout and believe it will work out to be very efficient. The overhead track runs to the elevator, and connects with a section installed on the elevator so that parts may be picked up on either the lower or upper floor and carried into the repair shop without having to be lifted after they are once on the elevator.

Another feature which we are egotistical enough to think rather nifty is the vestibule at the office and display room entrance; if handled right, this can be made a very attractive feature. If this entrance is at grade at that point, the alley will, we suppose, be a little above grade but there is plenty of room for a slight incline down inside the doorway.

As to material for construction, there is nothing in the writer's estimation as good as reinforced concrete, though steel framework with concrete or a combination tile and concrete floor is also good.

Cost Varies in Localities

It is impossible for MOTOR AGE to give estimates of cost and it is out of our line even if we could get the information necessary to figure costs. Your best course is to get a local or nearby contractor, one who knows local conditions, to figure the cost for you. On the basis of a similar building we know of, built this year, although it is a thousand miles from you, your building would cost between $130,000 and $150,000. We will say frankly, that this is not an estimate and must not be construed as one.

The equipment in the service station, shown in the October 6 issue of MOTOR AGE, is very complete and probably about what you would want. It costs $2,300.

New Northway Truck Announced

Continued from page 53

that they are perfectly straight and by removing a pipe plug in the crankcase the right angle bends in the oil leads are uncovered which makes it possible to force a wire through the passages should any deposit of sediment impede the flow of oil.

The clutch and transmission are in unit with the engine. Multiple disks alternately lined with asbestos fabric are used for the engaging services in the clutch. A ball bearing throwout collar is also fitted that allows of a very easy clutch operation. The four speeds of the transmission are geared 4.8 to 1 on low, 3.0 to 1 on first intermediate speed, 1.6 to 1 on second intermediate, with direct ratio on high. A ratio of 6.5 to 1 is used on reverse. The rear axle ratio is 7.5 to 1. A power take-off arrangement is provided for on the countershaft of the transmission to which is fitted a power pump for inflating pneumatic tires when the truck is so equipped.

The rear axle is of the worm drive type. Double annular bearings are fitted to the wormshaft and to the drive shafts. A steel casting is used to carry the worm which provides great rigidity and eliminates wormshaft vibration. Both brakes are of the internal expanding type and are fully inclosed. The brake bands are 2½in. wide and have a diameter of 18 in. The Hotchkiss type of drive is employed which transmits the driving and breaking strains to the springs.

The trucks are fitted with pneumatics or solids on choice. A maximum speed of 30 m.p.h. is obtainable when equipped with pneumatics and 20 m.p.h. with solid tires.

Equipment includes front and rear electric lights, electric starter, fully inclosed cab and the necessary tools. The 2-ton model lists at $3250 and 3½-ton at $4250.

Servicing the Farm Light

(*Continued from page 35*)

the right kind of information to those who don't.

In spite of how well you may have educated the owner so he can make minor repairs you will be called upon to give service when greater difficulties arise. What do you want in your service kit and how shall things be arranged. The illustration shows a very complete service outfit and might well be taken as an example.

This kit is neatly arranged and contains not only the testing equipment—test lamp and clips—meters and battery testing material, but repair parts such as spark plugs, coils, mixing valve, piston, valves, fuses, battery connectors and many other things that are useful in repairing.

If something very serious has happened to the plant that requires a factory service man, why not notify all of the plant owners when the factory man will be there and invite them to come to your service station and discuss their problems? While you are making this trip you will probably have to pass by a number of plants and it will be well worth your time to stop and see how the plants are running.

You will find that it will not only help you in servicing but will build up a new field for selling appliances such as flatirons, washing machines and vacuum cleaners. Remember, that properly educated plant owners mean less calls for service, and more satisfied "boosters" of your product.

NO MORE FUNERALS FOR THE HORSE

Cincinnati, Ohio, March 31—The horse no longer goes to funerals in Cincinnati. He has made way for the more modern motor hearse and the automobile carriage.

Fifty horse-drawn funeral carriages that cost $20,000 less than ten years ago trailed behind a motor hearse this week on their way to their last graveyard—the city dump. There they were abandoned for free salvaging. By this step, Cincinnati has taken the lead in a movement to discard horse-drawn funeral carriages on a large scale in favor of the automobile, says Edward Busse, of Busse and Bergmann, Cincinnati undertakers.

Mr. Busse's company recently replaced four horse-drawn hearses with motor hearses. The old hearses were then sold to a Cuban firm for use in that country for $40 to get rid of them. Their original cost was $4500.

PLAN OHIO TRUCK TOURS

Columbus, Ohio, March 30—The Columbus Automobile Trade association is arranging for a tour of trucks throughout central Ohio during the week of April 19 in which at least fifteen trucks will participate. The itinerary includes Circleville, Lancaster, Somerset, Zanesville, Newark, Mt. Vernon, Mt. Gilead, Delaware, Marion, London, Marysville, Washington and Mt. Sterling. Stops will be made at each of the towns visited and the trucks will be demonstrated. It is planned to demonstrate the economy and efficiency of trucks in that fashion.

JOIN RUBBER WORKERS' CLUB

Portland, Ore., March 28—Twenty-three firms are now listed in the membership of the Portland Rubber Workers' club, a year old organization which is proving a big factor in the development of the automotive industry in Portland. 100 per cent efficiency in quality and service is the aim of the club. It has selected L. M. Harper as president, W. T. Peters, vice-president, and Al Courts, secretary-treasurer.

GRAND ISLAND HOLDS SHOW

Grand Island, Neb., March 25—Grand Island's most successful automobile show was held last week. Attendance and sales were far in excess of any previous record.

The Readers' Clearing House

Questions and Answers

CONDUCTED BY ROY E. BERG
(Technical Editor, Motor Age)

THIS Department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by some one else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.

ADJUSTING STEERING GEAR ON A 1917 REGAL

Q—INSTRUCT how to adjust steering gear used on a 1917 Regal, model J.

2—What kind of paint could be used on a faded mohair top?—H. J. Shakal, Boyd, Wis.

1—Investigations will probably show that the objectional amount of the play or lost motion in the steering wheel is caused by back lash between the worm and worm wheel, due to the wear of these parts and also to wear of the thrust washers (TJ-33 and 44) at either end of the worm. Owing to the reduction between the worm and worm wheel only one-quarter section of the worm wheel comes in contact with the worm, while the front wheels are turned through their complete angle of deflection. When this section of the worm wheel shows appreciable wear the steering ball arm (TJ-25) can be removed from the square end of the worm wheel shaft and the steering wheel turned until another quarter section of the worm wheel is brought into action. Then replace the steering ball arm and securely clamp it in place with the screw provided. In this way the wearing portion of the worm wheel can be renewed three times.

Wear in the worm thrust washers can be taken up by loosening clamp screw at the top of steeering gear housing and turning the large adjustment nut (TJ-34) to the right. The nut should not be screwed down too tightly as this would make the gear work stiff. The adjusting nut bears down on the thrust washer between it and the upper end of the worm and takes up any play in the worm or steering column. After the nut has been properly adjusted be sure to tighten the clamping screw so that the adjustment will be permanent. This adjustment alone will sometimes eliminate the excessive play in the steering wheel.

Any end play in the worm wheel shaft can be taken up by loosening the nut (3026) at the center of the cover on the side of the steering gear housing (TJ-20) and turning the slotted screw (TJ-24) which projects through the nut, to the right. This screw extends through the cover and bears against the face of the worm wheel, holding the wheel against the worm wheel shaft.

All bushings, thrust washers and other parts of the steering gear, which may become worn from long service, can be easily removed and replaced with new parts.

2—Any reliable automobile accessory dealer could furnish you with a patented dressing for mohair automobile tops.

Axles and Gears

CLEARANCE OF PISTONS IN CHEVROLET.—REAR AXLE AND JACK SHAFT ASSEMBLY OF CHALMERS 6-30

Q—Publish diagram of the rear axle and jack shaft assembly of a 1916 Chalmers, model 6-30.

2—Give the thousandths clearance for fitting pistons in Chevrolet T. B. Model, 1920, using their own aluminum pistons. —Harry Davis, Peoria, Ill.

1—This is shown in Fig. 3.

2—The skirt of the piston should be fitted with about .003 to .0035 in. clearance and the top to .006 in. gradually increasing to this amount along the ring lands.

CHALMERS AXLE ADJUSTMENT

Q—The rear axle of a 1916 Chalmers produces a roar or grind under 20 miles per hr. The differential was taken out, but the trouble could not be located. Car has only been run 7,000 miles and has had good care. Instruct how to remove the drive pinion and short shaft after in front of the axle? How can I tell if the drive pinion is worn enough to cause the noise? Explain how to adjust rear gears after putting them back in housing.—M. J. Lewis, Denver, Colo.

We do not think that the car described above is a 1916 Chalmers. The Chalmers, 6-40, the 1916 model of the Chalmers factory, used a torque tube inclosed propeller shaft, with a rear axle transmission, but no universal was provided before the axle.

We believe, though, that this is the Chalmers 6-30. The illustration of the rear axle is shown in Fig. 2. To remove the differential pinion gear from this axle, the rear universal joint should first be taken apart so that its appearance will resemble the part of the joint shown in the illustration. Then remove the series of bolts that hold the front part of the axle to the axle housing. Two of these bolts are designated by the letter A. This will allow the pinion gear and its shaft, and the part of the housing that incloses the pinion gear, to be removed. The procedure of removing the bearings is then a simple matter. If the rear set of roller bearings has become worn, a vibrating effect will be set up in the axle housing that will produce a loud whirring noise. This will be discovered as soon as the bearings are exposed.

To replace the pinion gear just reverse the operation described above. To see that the gears are properly meshed, first line the back face of the gears up so that they make a perfectly straight line across their surfaces. This will

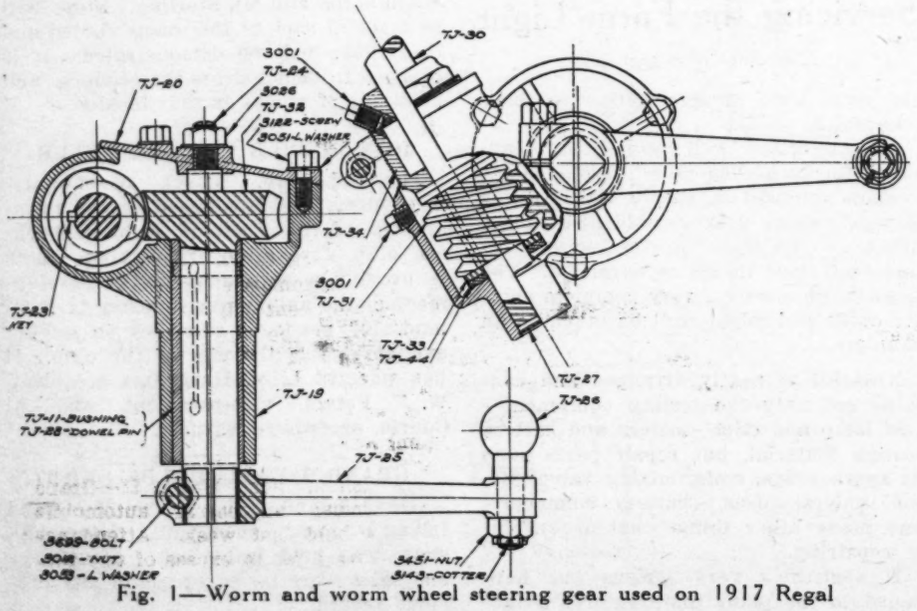


Fig. 1—Worm and worm wheel steering gear used on 1917 Regal

give the approximate adjustment of the gears.

To make the final adjustment, a piece of wrapping paper, of the ordinary kind, which measures about 0.008 in. in thickness should be forced through the teeth of the gears. If the paper is not marred by this procedure the teeth are set a little bit too far apart. The ring gear should then be moved over slightly to the right when viewed from the rear. This is done by backing off the collar on the right hand side designated as B. The other collar to the left, also designated as B should then be turned to move the differential carrier to the right. This will then close up the tooth clearance. When the wrapping paper just begins to show signs of being squeezed the teeth will have the correct clearance. Do not forget to set the dogs that hold the adjusting collars, else all this adjusting will be done for naught.

TROUBLE WITH DODGE STEERING DEVICE

Editor MOTOR AGE—In answer to your request for correspondence on New Trouble Discovered. I find this trouble on the Dodge steering device very frequently. The bushing at top of steering column directly under wheel becomes dry, also at front end of drag link where cap fits on ball of steering knuckle. On some makes of cars the bushing is made of wood or fiber. When such is the case the only remedy is to take steering column apart and ream out same. Very often these become swollen by moisture or oil, excess lubrication. As to drag link I generally take same apart, clean with kerosene and thoroughly lubricate.—J. J. Johnston, Larson-Oldsmobile Co., Philadelphia.

OVERHAULING 1917 MAXWELL

Q—To what extent must a 1917 Maxwell touring car equipped with demountable wheels be stripped down in order to do the following work:

(1) Install new piston rings in all cylinders.
(2) Tighten up main and connecting rod bearings.
(3) Examine and replace or adjust clutch throwout bearings.
(4) Tighten studs that hold flywheel on crankshaft.

2—There is a lead from the clutch housing that loses the oil from the clutch and it seems to come from a place between the flywheel housing and crankcase. Is there a gasket between these two parts?

3—Would it be a feasible idea to install a 1-in. Marvel carbureter on this car? The car is equipped with a Stewart vacuum system. Where could the tank be put, as spare wheel carrier bracket is on the rear end of the frame?—H. S. Knight, Benton Harbor, Mich.

1—New pistons can be installed by removing the oil reservoir and the detachable head. This will enable you to loosen the connecting rod bearings and push the pistons out of the top of the cylinder block. The connecting rod bearings are the only ones that can be adjusted by removing the oil reservoir. We assume from the way in which the question is asked that you intend to do all of this repair work at one time. Because of the construction of this engine we advise that it be removed from the frame which will give accessibility to all of the parts mentioned. A diagram of the engine is shown in Fig. 4. There is nothing that shows a gasket between the flywheel housing and the crank case but we know of cases where leakage of oil was caused by the loosening of the bolts that hold these parts together.

3—You will have to decide what carbureter to install by comparing claims of the various manufacturers. An arrangement can easily be made which will have the frame holding the gasoline tank, form a spare wheel carrier bracket as well. This is shown in Fig. 5.

TO assist readers in obtaining as a unit all information on a certain subject. MOTOR AGE segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

Axles and Gears

H. J. Shakal.....Boyd, Wis.
Harry Davis.....Peoria, Ill.
M. J. Lewis.....Denver, Colo.
H. S. Knight....Benton Harbor, Mich.
Bryan Smith, Thompson Repair Co.....West Point, Nebr.
R. A. Terrell.....Grinnell, Ia.

Engines

Esch-Scherer Motor Co..Sutton, Neb.
Walter Baker.....Canal Dover, Ohio
Louis Gaegle.....Streator, Ill.
W. A. Stacey.....Abilene, Kan.
Charles Holmes.....Washington, D. C.

The Electric System

R. M. Armstrong....Connellsville, Pa.
Lee Bivans.....Latour, Mo.
W. G. Gaffrey.....Reno, Mo.
Ardell Bergseth.....Peterson, Minn.
H. J. Shakal.....Boyd, Wis.
Charles Holmes....Washington, D. C.
Bernard Axmaker..White Lake, S. D.
Leon A. Adams Co...Four Oaks, N. C.
Harold Bassett.....Jefferson, Ia.
Ralph F. Binkley.....Detroit
Joseph Zrust, Jr....Edwardsville, Ill.
E. F. Chaskel, Chaskel Auto Co. .....Florence, Ind.
Joseph D. Robinson.....Cabot
A Reader.....Minneapolis, Minn.
H. F. Crump.....Lenoir, N. C.
Vern D. Arthur....Marble Rock, Iowa
C. E. Ketteri.....Elwood City, Pa.
E. H. Draeseke.....Visalia, Calif.
Lloyd L. Buick.....Atwood, Ill.
W. O. Wilcox.....Rosemount, Minn.
J. Mitchell.....Nanaimo, B. C.

Carburetion

Stanley Malicki.....Hillsboro, Kan.
E. H. Draeseke.....Visalia, Calif.
Bryan Smith.....West Point, Neb.
Lee Bivans.....Latour, Mo.
T. E. Albright Buick Co.....

Miscellaneous

.....Crawfordsville, Ind.
J. A. Burke.....Kingsley, Ia.
W. J. Bewlby.....
.....Central Mercedita, Cuba
Arthur Koenig.....Terre Haute, Ind.
Forrest W. Lewin.....Galva, Ill.
W. R. Melaun.....Dallas, Tex.
C. William Hansen.....New York
Ardell Bergseth.....Peterson, Minn.
Francis Bauer.....Mitchell, S. D.

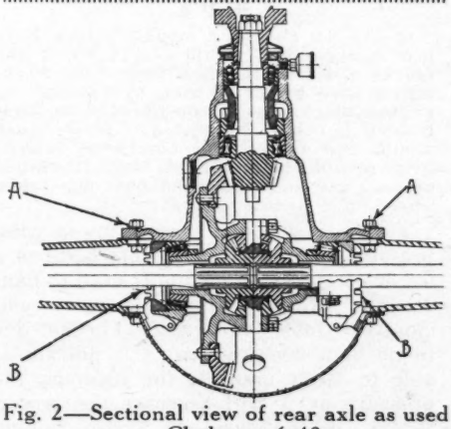


Fig. 2—Sectional view of rear axle as used on Chalmers 6-40

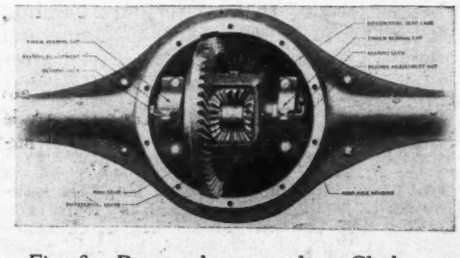


Fig. 3—Rear axle as used on Chalmers 6-30

OIL CONSUMPTION OF REGAL 4

Q—About how many miles per quart of cylinder oil should a four-cylinder 1917 Regal car, model J, make under good conditions?—H. J. Shakal, Boyd, Wis.

1—This car ought to get about 150 to 175 miles per quart of cylinder oil.

REBUILDING A 1911 STODDARD-DAYTON

Q—In building a racer out of a 1911 Stoddard-Dayton car will it pull a 2½ to 1 gear? It is 45 h.p., 4¾x5 on 4 cylinders and uses 37x4½ tires. How fast will it go with this gear?

2—Was this car equipped at factory with 36x4 in. tires and would 37x4½ in. tires make a difference in the speedometer reading? If so, how much?

3—Can I get rims to fit 36x4 in. wheels so I can use standard size tire?—Bryan Smith, Thompson Repair Co., West Point, Nebr.

1—With the gear ratio mentioned and a tire size of 36 in., your car will attain a speed of over 80 m.p.h. However, we do not advise you to build a racer out of the car. It is too old. The acceleration with this set of rear axle gears would be very sluggish. The weight of the whole outfit with the performance from this set of gears would also further tend to cut down the acceleration.

2—Our records do not show the tire size on this car.

3—36 by 4½ in. is now a standard sized tire. You will have to make a slight change in the rim size to accommodate this sized tire.

Engines

TIMING A 6-45 DETROITER

Q—How would you interpret the readings, as follows:

A
2 & 5—I. C.
1 & 5—D. C.
3 & 4—E. O.
1 & 6—I. O.
---
1 & 6—E.C.

R
3 & 4—I. C.
2 & 5—D. C.
1 & 6—E. O.
2 & 5—I. C.
2 & 5—E. C.
---
1 & 6—I. C.
3 & 4—D. C.
2 & 5—E. O.
3 & 4—I. O.
---
3 & 4—E. C.

This car is model 6-45, 1915, Detroiter, Continental engine. Am able to get some of the above, but not the balance of reading, and am anxious to have the right timing of engine.—R. A. Terrell, Grinnell, Ia.

In timing the engine the use of any one set of figures or markings will do, where there is a single camshaft. The

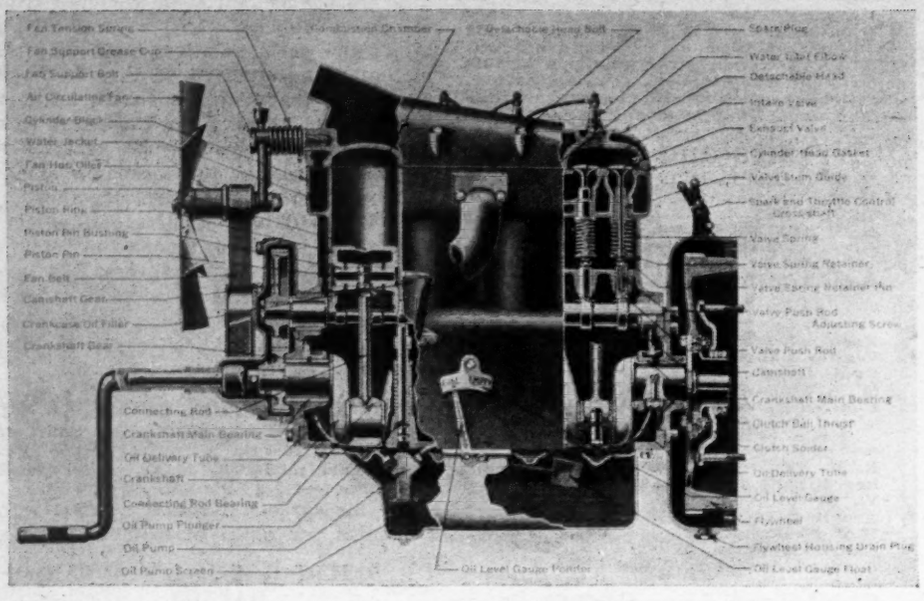


Fig. 4—Sectional view of 1917 Maxwell engine showing the construction of the rear main crankshaft bearing

others are shown for convenience. In A, IC means intake closes, DC means dead center, EO is exhaust opens, IO denotes intake opens and EC is exhaust closes. These will apply in the other tables. But in R you are wrong, for you have two with IC, whereas one should be IO, meaning intake opens. In the first instance, for example, set the camshaft so the intake on No. 2 and 5 cylinders closes according to the remarks on the flywheel and the entire engine will be correctly timed.

REPLACING ALUMINUM PISTONS WITH CAST-IRON PISTONS

Q—Is it advisable to use cast-iron pistons in a Chalmers 1919 model car which the factory has equipped with Lynite aluminum pistons?—Esch-Scherer Motor Co., Sutton, Neb.

It is advisable to use cast-iron pistons in place of the aluminum pistons in case the aluminum ones are causing trouble. There are several repair shops that are making a business of regrinding cylinders and installing pistons and results of their work show that an installation of this kind has proved satisfactory. However, engineers contend due to the fact that the original design calls for the use of extremely light weight pistons that changing to cast-iron pistons will result in a greater strain on the bearings.

KEROSENE ENGINE EXHAUST OUTLET

Q—Will running the exhaust pipe of a 6 hp. single cylinder kerosene engine into the foundation drain tile which is 125 ft. in length and 4 in. in diameter (inside) and cementing the pipe up tight, prevent noise? Would this cause any back pressure or heat the engine? Is this size of tile large enough? If not, what size do you recommend?

2—Would a four-cylinder, three-bearing crankshaft that is sprung .012 of an inch at center main bearing cause a knock providing bearings are tight?—Walter Baker, Canal Dover, Ohio.

1—A 4-in. drain tile will be large enough and will not result in causing any additional heating effect or back pressure.

2—This is sprung considerable and it will undoubtedly cause a bearing knock.

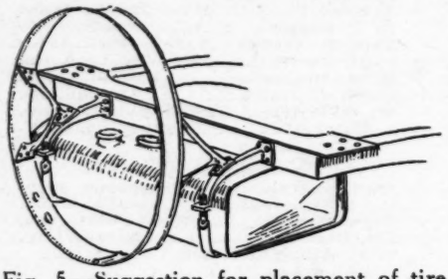


Fig. 5—Suggestion for placement of tire carrier and gas tank on 1917 Maxwell

LOWERING COMPRESSION OF B-55 BUICK

Q—As all the new model Buicks have low compression, would a 1914 Buick car, model B-55, which has been run 30,000 miles, give better service by raising the engine blocks by means of gaskets, thus lowering the compression? How much would you advise that blocks be raised? New pistons have already been installed on car, valves ground and bearings taken up.—Louis Gaegle, Streator, Ill.

1—The new Buick has a lower compression than the old models because a lower compression engine is used to handle the present day fuels more efficiently. Unless the engine knocks, due to its high compression, it is not advisable to apply methods for reducing the pressure as it will decrease the power. If this is the case we advise raising the cylinder block about ⅛ in. Perhaps it would be well to start building it up by using first a ⅛-in. shim and then a 1/32-in. shim, making a trial after each one is installed to determine what results have been obtained.

MANIFOLD LOADING ON B-55 BUICK

Q—A 1914 Buick car model B-55 is equipped with a G. L. B. P. Rayfield carbureter. The carbureter has been adjusted and the car works fine when traveling at high or low speed, but not when car is pulling hard. If on a heavy pull you step on the accelerator the carbureter overloads and engine starts to miss. It continues to do so until on good roads again and then it works fine. Is this not caused by the gas drawn into the cylinder and compressed too tightly and overloads the carbureter? The ignition is in perfect condition and timing is correct. Can you suggest how this trouble could be eliminated?—Louis Gaegle, Streator, Ill.

1—In spite of the fact that you claim ignition and timing is correct and the carbureter is in proper adjustment we believe your trouble is entirely due to poor carburetion. Loading of the manifold is probably due to the condensation which is probably caused by the length of the intake manifold. This might be remedied by installing a hot spot manifold or perhaps greatly reduce by shortening the intake.

INSTALLING ALUMINUM PISTON IN 1917 OVERLAND

Q—A 1917 Overland car model 85, Four-A, gives excellent satisfaction with the exception of one thing and that is vibration of the chassis which makes long trips in the car very wearisome. The vibration seems to come from the natural movement of the engine. Would the proper installation of aluminum pistons and connecting rods lessen this largely?—W. A. Stacey, Abilene, Kansas.

1—The car being equipped with a four-cylinder engine will always possess a certain amount of vibration which cannot be eliminated. The vibration in a four-cylinder engine is very pronounced in a vertical direction and is chiefly a result of the action of the weights of the reciprocating parts. The use of lighter pistons and connecting rods will undoubtedly reduce vibration some and will speed up the engine. It is important that refitting of the aluminum pistons be properly done for if there is too much clearance there will be considerable slap.

OVERHEATING

Q—If an engine overheats would it help the cooling by making the pulley on the fan smaller so it would revolve faster?—Charles Holmes, Washington, D. C.

Overheating of the engine is probably caused by other reasons rather than the size of speed of the fan. Carbon deposits, poor lubrication, improper circulation of the water, spark retarded too far causing late ignition, defective ignition systems, or improper carburetion may be the cause of overheating. It is not advisable to reduce the size of the pulley and speed up the fan as we do not believe this will remedy the cause.

STODDARD-DAYTON KNIGHT

Q—Publish power curve of Stoddard-Dayton Knight 6-48 engine.—R. M. Armstrong, Connellsville, Pa.

1—This car was built in 1912 and we have no information as to its power development from which we can plot a curve. The N. A. C. C. rating of this engine is 48.6 hp.

HOLMES HAS STEEL FRAME

Concerning the statement made in the March 11 issue of Motor Age relative to the wood frames employed on cars, we wish to correct the statement made. The Holmes car uses a steel frame. The Franklin is the only car to our knowledge using the wood frame.

CARBON ON BUICK NO. 45 EXHAUST VALVES

Q—Show how to prevent the exhaust valve stems of a Buick H-45 from sticking? They have to be ground very often and stems cleaned often to keep car in good running shape.—Fred E. Albright, T. E. Albright Buick Co., Crawfordsville, Ind.

This trouble does not seem to be present to any great extent in Buick models of the year mentioned, which points to the fact that it is a result of some individual fault. One of the first things to investigate is the condition of your mixture. If your carbureter is not properly adjusted an extremely rich mixture is being used at all times it will undoubtedly be due to the poor condition of present day fuel foul the plugs and cause excessive carbon deposit on exhaust valves. However, it is also very possible that the ignition system is not functioning properly. The battery may be weak with a result that the spark will not be long enough to properly ignite the mixture. It would be very well also to examine the spark plugs and see that the distance between points is properly adjusted.

ENGINE POWER CURVES

Q—Publish power curve for the Maxwell 25 engine.

2—Publish power curve for the Essex engine.

3—Publish power curve for the Haynes engine.

4—Publish power curve for the Chevrolet engine.—W. G. Caffrey, Reno, Nev.

1—Power curve is shown in Fig. 11.

2—Power curve of the Essex engine was published in a recent issue of MOTOR AGE.

3—Power curve of the Haynes six-cylinder engine is shown in Fig. 7.

4—We have no information on Chevrolet models from which we can plot a power curve.

DORT ENGINE POWER CURVE

Q—Publish power curve of Dort engine.—Ardell Bergseth, Peterson, Minn.

1—The power curve of the Dort engine is shown in Fig. 8.

TESTING COMPRESSION PRESSURE

Q—Instruct how to test the compression in pounds of an automobile engine?

2—Is an ordinary Twitchell air gage accurate enough to test the compression?

3—What is the usual compression for gasoline engines and what for kerosene?

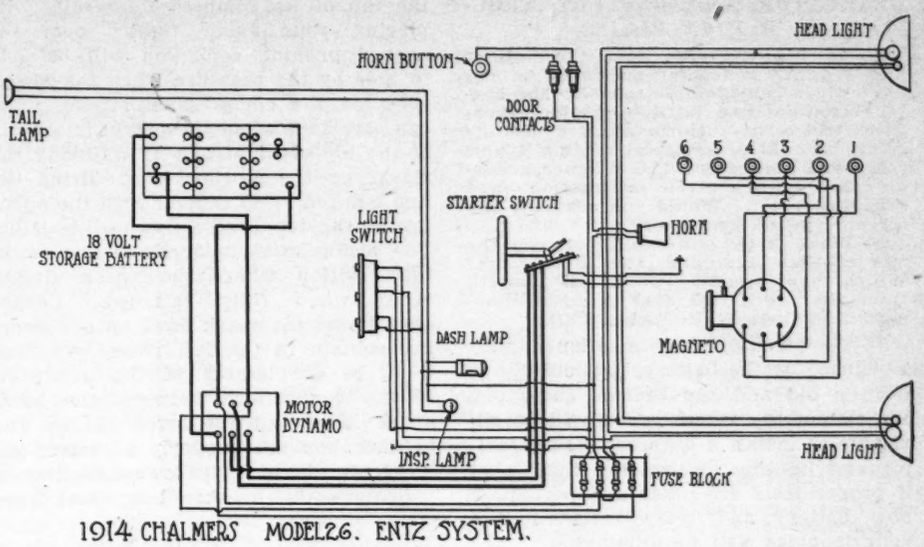
4—Will a Ford engine get hot and boil the water in the radiator more quickly if equipped with a hot spot manifold than with the regular Ford equipment?—Vern D. Arthur, Marble Rock, Iowa.

1—There are several patented devices with which you can test the compression of an engine, one of which was described in a recent issue of MOTOR AGE. This particular device was made to hold an air gage such as the Twitchell and when testing for the compression was to be screwed into the cylinder in place of a spark plug. It is only necessary to turn the engine over by hand and a quite accurate reading of the compression pressure can be obtained from the air gage.

2—See 1.

3—The usual compression of gasoline engines is about 70 lb. and that of kerosene engines used in tractors about 55 to 65 lb.

4—The hot spot manifold has nothing to do with the heating of the engine but is merely a means of heating the intake charge by bringing it in direct contact with the heated exhaust. This is done to get better carburetion and of course would have an indirect effect on the performance of the engine so far as heating is concerned, but would be for the better.



1914 CHALMERS MODEL 26. ENTZ SYSTEM.

Fig. 6

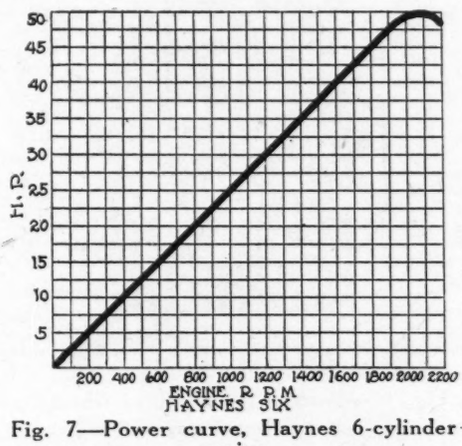


Fig. 7—Power curve, Haynes 6-cylinder engine

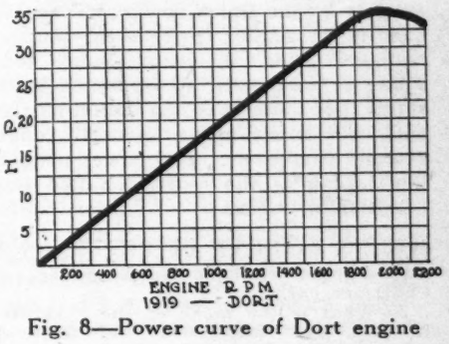


Fig. 8—Power curve of Dort engine

HIT AND MISS ENGINE EXPLOSION

Q—Does a gasoline engine of the hit-and-miss type make a louder and harder explosion when working than when idling?—H. J. Shakal, Boyd, Wis.

There is no difference in the sound of the explosion of a hit-and-miss type gasoline engine, but when working the explosions occur at shorter intervals. A gas engine that is operating with a hit-and-miss governor is not idling when intermittent explosions are heard during periods of comparatively quiet operation. The occasional explosion heard when an engine of this type is operating is just as loud as if the explosions were occurring with greater regularity. An engine of this type stores up energy in the flywheel and when enough energy has been extracted from the flywheel to bring the speed down to a point where the governor allows an explosion to occur, then the operation will be under full load during this one explosion. The noise, therefore, will be the same, whether the explosions occur with great regularity or infrequently.

The Electric System

STARTING, LIGHTING AND IGNITION SYSTEM ON A MAXWELL

Q—A 1917 Maxwell is equipped with a generator storage battery and a non-vibrating coil. The generator charges the battery while engine is in motion. If car is run at high speed will the battery become overcharged?

2—Since the generator produces current when in motion, would it be a good idea to connect the generator to the coil or would it be too strong for the coil?—Charles Holmes, Washington, D. C.

1—The generator is regulated so that it attains its maximum charging rate at a certain engine speed and it is impossible to increase that rate by merely speeding up the engine. This system has been designed by competent engineers and if they had deemed it of any advantage to connect the generator directly to the coil it would have been done. The battery cannot be overcharged because of their system of regulation in which a cut-out is used.

2—See 1.

GENERATOR AND BATTERY TROUBLE ON ELGIN

Q—During the past year the battery and Wagner generator on an Elgin car have given considerable trouble. The battery trouble may be due to the generator, which in turn is affected by the relay. Would you suggest getting a new relay and generator? The Wagner generator has always given satisfaction on a Studebaker car. Would you advise a different type of generator?

2—What is the difference between the new Jordan Six and the Buick Six? Which has greater speed and power? Have they both Red Seal engines?—Bernard Axmaker, White Lake, S. D.

1—The trouble you mentioned may be caused by the battery, particularly so if it is old and has become sulphated. We cannot say whether it would be advisable to install a different make starting and lighting system, but think that if proper tests are made and perhaps a new battery and relay installed that your troubles will be eliminated.

2—The Jordan car is an assembled car while the Buick is a car constructed entirely by the Buick company. The Jordan is a higher priced car and is equipped with a custom-built body. There is practically no difference in the speed that these cars can obtain as they both will make about 65 m.p.h. under average conditions. The power plant of the Jordan is the 6-cylinder Red Seal Continental engine.

WIRING DIAGRAM OF CHALMERS 26

Q—Publish wiring diagram of model 26 Chalmers car.

2—What is the make of the generator in the above mentioned car?—Leon A. Adams & Co., Four Oaks, N. C.

1—Diagram of the 1914 Chalmers 26 is shown in Fig. 6.

2—The generator used was the Entz.

WIRING DIAGRAM OF 1914 JEFFERY

Q—Publish wiring diagram of the U. S. L. starting and lighting system, type E-49, as used on the 1914 Jeffrey car, model 93.—Harold Bassett, Jefferson, Ia.

This diagram is shown in Fig. 9.

STARTING TROUBLE ON 34-B OAKLAND

Q—On a model 34-B Oakland car, after installing new piston rings, replacing the intake and exhaust valves with new ones and placing a washer at the bottom of the valve springs to give more tension, the engine would not start. When more gas was given to the carbureter and a good spark produced the engine would run for about five minutes, but seemed out of time. Would the changing of the parts mentioned have caused this? How can it be remedied?—Ralph F. Binkley, Detroit.

Changing the parts mentioned and placing a washer at the bottom of the valve springs to give more tension will not change the timing of the engine. We believe the trouble is caused by poor seating valves. Be sure that your valves are properly ground in and you will probably find that the engine will run all right.

IGNITION TIMING OF 1917 REGAL

Q—Explain ignition timing for a four-cylinder 1917 Regal car, model J.—H. J. Shakal, Boyd, Wis.

1—To time the spark turn the engine over with the handcrank until the piston in cylinder No. 1 (front) has reached the top of its compression stroke. By placing your finger tightly over the opened priming cock you will be able to note by the pressure when the piston rises on the compression stroke. You can ascertain when the piston is exactly at the top of its stroke by watching the marks on the flywheel rim. Bring the line marked "1-4" central with the opening at the top of the flywheel housing. The piston in cylinder No. 1 is now in the position where the spark should occur when fully retarded. Consequently set the spark lever on the steering column in the full retard position, i. e., at the bottom of the quadrant. If the connections between the hand spark lever and the lever (J) on the breaker box are properly adjusted, the lever (J) will be in its lowest position.

Remove the breaker box cover (see Figure 10) loosen breaker cam retaining screw (K). Now, with the fingers turn the breaker cam (L) in the direction of rotation until the breaker points just start to separate and then tighten the screw. This is the point where the spark occurs, so remove the distributer plate and connect the terminal when the distributer brush is opposite the spark plug on cylinder No. 1. When the one cylinder is properly timed the other three cylinders will also be properly timed, so all that remains is to connect the distributer terminals with the proper spark plugs. The engine fires 1-2-4-3, therefore, the next terminal to the right (in direction of rotation) should be connected to the spark plug on cylinder No. 2, the next to No. 4, and so on.

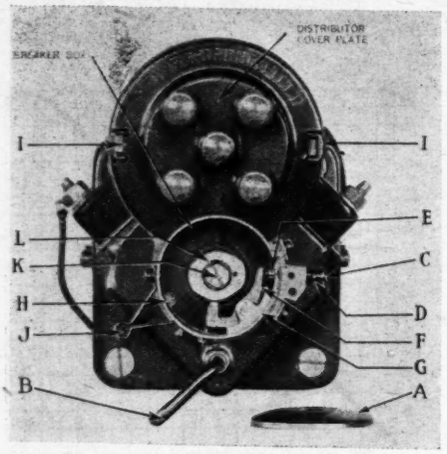


Fig. 10—Parts to be observed when timing Regal engine

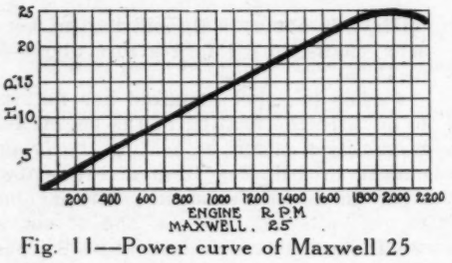


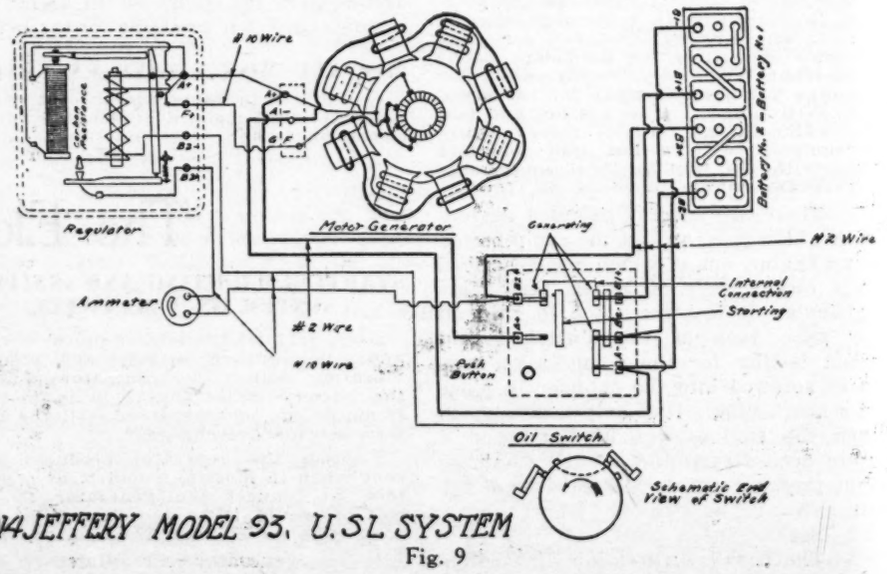
Fig. 11—Power curve of Maxwell 25

To check up the timing of the ignition, remove the wire from the spark plug of cylinder No. 1 and hold the terminal away from the top of the plug about one-sixteenth of an inch, then crank the engine slowly and stop the moment the spark jumps. If the ignition is timed properly the center line on the flywheel rim marked "1-4" will be at the center of the opening in top of the flywheel case.

TIMING FORD IGNITION

Q—In tuning up a Ford engine the valves were ground, new piston rings put in, and while cleaning out the timer the timer roller had moved a little. No attention was paid to this and timer cap was replaced, but on an attempt to start the engine there was only a feeble explosion. The timer was then removed and roller adjusted to its original place, but engine refuses to work. Explain what the trouble is and publish diagram of adjustment of timing mechanism.—Joseph Zrust, Jr., Edwardsville, Ill.

The fact that only a feeble explosion was obtained after the roller moved the first time indicates that the ignition was occurring late. In attempting to correct the trouble you must have moved the roller in the same direction in which it slipped and resulted in changing the time so that no explosion was obtained. The firing order of the Ford is 1-2-4-3. To retime the engine bring the number 1 piston to the end of its compression stroke and adjust the roller so it makes



1914 JEFFERY MODEL 93, U.S.L. SYSTEM

Fig. 9

contact with one of the stationary contacts. The lead from this contact point plug. The way to determine when the piston is at the extremity of the compression stroke is to remove the plate and watch the valves. When the exhaust valve of number 3 cylinder begins to open, number 1 piston will be at the end of its compression stroke. When number 1 cylinder is in time all of the rest of the cylinders will be in time.

RETEMPERING MAGNETO MAGNETS

Q—Can the magnets on a Simms or Splitdorff magneto be retempered so they will hold a charge? They will hold a keeper with 25-lb. pressure when first charged, but after an hour or so one of them loses its magnetism.—Phillip J. Leonard, Topeka, Kans.

We see no reason why they cannot, but we advise sending the magnets to the makers of the instrument. Naturally if the metal is soft it will not retain the magnetism. We are inclined to believe, however, that you are reversing the poles. If a magnet will carry 15 lbs. it is in good shape. When you send one send all and have them put in like condition as to hardening and charging.

FIELD COILS FOR SPLITDORF-APELCO GENERATOR

Q How can 2 lb. of 16 gauze cotton covered copper wire be used to change the winding of a Splitdorf-Apelco starter and generator so it will generate from 15 to 25 amperes.—Joseph D. Robinson, Cabot, Ark.

This generator is designed to charge at a rate of about 15 amperes. It is not the policy of the company to reveal all of the details of the design of this machine. If the field winding is so nearly destroyed that it is impossible to get proper insulation the only thing to do is to cut through the coils, count the number of turns in each coil and then measure the size of the wire used. This will enable you to rewind field coils that will give the same results as before. Without correcting all of the details of the design it would be impossible to take any size of wire and wind field coils.

DELCO WIRING ON BIG SIX OAKLAND

Q—Instruct how to install an ammeter on a 1914 Big Six Oakland car model 6-60.

2—Publish wiring diagram of Delco system used on a Big Six Oakland car model 6-60.

3—Does the above mentioned car use short or long spark plugs and which are proper.

4—Are the dry cells used in operating the relay for starting purposes?—A Reader, Minneapolis, Minn.

1—Because of the type of wiring used on this car we do not advise you to connect an ammeter in on the circuit. The current is split in four ways, each division going to each 6-volt section of the battery. It would therefore be necessary to install four ammeters to secure a correct knowledge of what the battery is doing.

2—The wiring diagram for this car is shown in Fig. 13.

3—We advise you to ask your dealer in this regard as this is a bit of detailed information that we have never thought necessary to collect.

4—Yes. The diagram shows the connections from the dry cells to the relay to the distributer and to the ignition switch.

INSTALLING A MAGNETO ON 1913 CADILLAC

Q—In stripping down a 1913 seven passenger 4 cylinder Cadillac can a high-tension magneto be installed in place of the motor generator and on the same shaft? This shaft turns at the same speed as the crankshaft. Would a high-tension Bosch magneto give good service? A presto tank is to be installed for the lights.—H. F. Crump, Lenoir, N. C.

The high-tension magneto is a very reliable source of ignition and will give very satisfactory service if installed on this model car. For a 4-cylinder, 4-cycle engine, magneto must be driven at a crankshaft speed and as the motor generator was driven at that speed the magneto can be placed on the same shaft.

REGULATION OF NEW FORD GENERATOR

Q—What system of regulation is employed in the generator with which the new Ford cars are equipped? Is it the third brush or variable resistance?—Vern D. Arthur, Marble Rock, Iowa.

Third brush system of regulation is used on the new Ford generator.

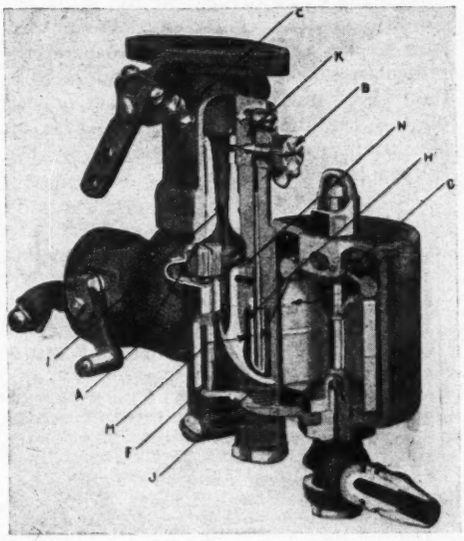


Fig. 12—Sectional view of Stromberg carbureter as used on Allen 41

LIGHTING SYSTEM ON KING 4

Q—On a four-cylinder King car, model B, equipped with a 4 W. H. T. Bosch magneto, would it be possible to install a generator to use for headlights only, or would a storage battery have to be used? The battery with which car was equipped did not give satisfactory light. A Presto light is now being used.—C. E. Ketteri, Ellwood City, Pa.

1—You will have to install a battery system, as the only type of generator now used to supply current directly to the lights is the Ford magneto. A battery, when properly charged, will give sufficient and safe illumination of the road and the trouble you had with your old storage battery was probably due to the fact it was allowed to run down.

GROUNDING FORD HEADLIGHTS

Q—If both the headlights on the Ford are grounded will it damage the magneto. A 9-volt 27-candlepower bulb is used and a fine white light is the result. Scholer lens are also used.—E. H. Draeseke, Visalia, Calif.

1—There will be no injury done if the headlights are grounded, except that one charging of the magneto will not last quite as long as if the headlights were connected in on the magneto circuit.

BURNING OUT OF IGNITION COILS

Q—What is the general cause of an ignition coil burning out?—Lloyd L. Buick, Atwood, Ill.

Generally ignition coils burn out because of faulty condenser construction. During the war the cars used by the army were given very rough usage and an investigation of ignition troubles due to burned out coils seems to point to the condenser as the offender. Contact points made of inferior metals are apt to cause trouble in the coil sooner or later. After a coil has been tampered with and if by any chance the repairman alters the space in the safety gap the installation of the windings is apt to be injured and strained. In cars using a battery ignition system, should the connections of the battery become loose and the voltage of the generator consequently rise to extreme pressures then the coil is apt to suffer some injury.

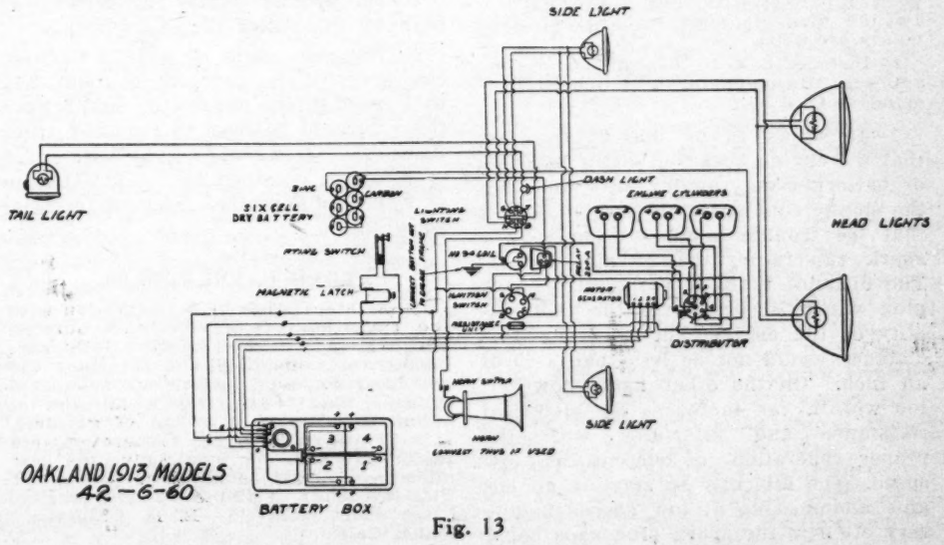


Fig. 13

IGNITION TROUBLE—1917 MAXWELL

Q—There is a popping noise in one cylinder in a 1917 Maxwell 25. The cut-out is burnt out in the dash and to keep the battery charged a wire is run from the generator to the battery which is disconnected when idle This popping noise seems to be worse when this wire is connected or when the battery was fully charged. The cut-out is on the exhaust pipe. The engine has no power when this noise begins. The carbon has been removed and the valves ground to no avail. The carbureter has been cleaned and the fuel line is clean. The intake is tight at the joints. The carbureter adjustments have no effect. Valve timing is correct. Ignition timing is correct on three cylinders, but on the second cylinder the breaker points broke about 1 in. ahead of the other cylinders on the compression stroke. The breaker points are set correctly. Could this be caused by one of the corners on the distributer post being a little higher than the other three? The condenser looks as though it were damaged There is a thick wax like substance that has run out of the ends of the condenser. The breaker points are clean on this timer and the connections are good. It delivers a good spark at breaker points and at plugs which are in correct rotation.

2—What is the price of a new distributer post? A new condenser? New dash panel on this model car?—W. O. Wilcox, Rosemount, Minn.

1—The generator is always in the external circuit until it is cut into the main line by the operation of the cutout. When the cutout burned out and the connection was made directly to the battery the voltage of the generator which probably ran up as high as 20 or 30 volts was forced on the condenser causing it to burn out. With the condenser out there is nothing left to absorb the excess current and the coil simply builds up and discharges. The remedy is to install a new condenser and cutout.

2—We are not able to furnish prices on the parts and we advise taking the matter up with a Maxwell dealer.

TIMING BOSCH Z R 6 MAGNETO

Q—A car equipped with a Bosch Z R 6 magneto runs well when going 15 m.p.h. or more, and has lots of power, but if slowed down below 15 m.p.h. and then given more gas will buck on either magneto or battery. With the engine running idle it will run well on magneto if spark is advanced, but if spark is retarded two-thirds the engine will stop, but will run good on battery with fully retarded spark. Do the magnets need recharging? The points are good.

2—Instruct how to dissemble and time a Bosch ZR6 magneto —J. Mitchell, Nauacino, B. C.

1—It seems to us due to the fact that the engine bucks on either magneto or battery when running slow and that the engine runs smoothly at high speeds that the trouble is due to too wide a spark gap rather than weak magnets. The distance between the electro spark plug varies according to the individuality of the engine but normally this distance would not be less than 1-50 of an inch. On the other hand, however, too wide a gap increases the electrical resistance and interferes with the proper generation of current at low speed. The difficulty in starting an engine and missing at low speeds is due very often to the spark plug gaps being too wide and as the spark will have a tendency to burn the electrodes, thereby increasing the gap, it is especially important that the plug be examined occasionally for the assurance that the gap is not too great. If just one cylinder seems to be missing it might also be caused by a short circuited plug, or to worn or broken cable or to loose cable connections. If you find that none of the above conditions are causing your trouble it is probably a case of weak magnets. Generally speaking, it is not advisable for the average car owner to remove the magnets and recharge them. The Bosch Company states that the magnets and end plates are not intended to be removed and that the guarantee on a magneto returned for repair if the screws securing such parts have been withdraw. The service station man who is acquainted with electrical equipment can undoubtedly remove the magnets and charge them satisfactorily. The magnets themselves can be removed by taking out the four screws on either side of the magnet and the two screws that hold on the end plate.

2—In timing the magneto the crankshaft is rotated to bring the piston of No. 1 cylinder (in automobile practice this is the cylinder nearest the radiator) exactly on dead center of the compression stroke, and the piston is to be maintained in that position. The magneto is then to be secured to its bracket or bed on the engine, and the control arm on the interrupter housing placed in the fully retarded position.

With that done, distributer plate should be removed by withdrawing the two holding screws, or releasing the two catch springs, as the case may be, thus exposing the distributer gear and brush. The cover of the magneto interrupter housing is also to be removed to permit observation of the interrupter.

The armature should then be rotated by means of the exposed distributer gear in the direction in which it is to be driven until the platinum interrupter contacts are just about to separate, which occurs when the interrupter lever begins to bear against one of the steel interrupter cams.

The armature should be held in that position while the magneto drive is connected to the engine, due care being taken that the piston of No. 1 cylinder is still exactly on top dead center of the compression stroke. The installation is completed by replacing the interrupter housing cover and distributer plate, and connecting the cables between the magneto and spark plugs. The foregoing will establish the desired relationship between the magneto armature and the engine crankshaft. It should be noted, however, that while these instructions cover the average engine, the exact magneto timing for individual engines is best determined by trial. Where specific instructions for magneto timing are given by the engine manufacturers, it is recommended that such instructions be followed in preference to those herein given.

Carburetion

MILLER CARBURETER

Q—Which of two is the original Miller racing carbureter that is made by the Indianapolis concern with one jet and known as New Miller carbureter or multi-jet carbureter made by Miller Co of California.

2—Could the gear ratio of a 1912 Cadillac rear axle be changed from 3.5 to 1 to 2 to 1? Is there enough space for larger pinion or ring gear? We have a big 6-55 hp. engine in a Cadillac chassis.—Stanley Malicki, Hillsboro, Kans.

1—The original Miller carbureter was built by the Miller Co. of California.

2—The gear ratio of a 1912 Cadillac can probably be reduced to about 2.75 to 1 with safety but we do not believe that it would be wise to reduce further than this. However, a gear ratio of 2 to 1 can be obtained by the installation of a new differential and differential housing.

FORD CARBURETERS

Q—A 1918 Ford is in A-1 condition with the exception of the Holly carbureter, which gave trouble. A new Holly carbureter was installed but it makes the car hard to start. After car is started it runs fine. Car gives a mileage of about 19 miles to a gallon of gasoline. If a Zenith or Stromber carbureter were installed, which one would give the best mileage, at least 30 miles or better. (I like the looks of the Zenith on account of the short manifold.—E. H. Draeseke, Visalia, Calif.

This is a question that we cannot very well advise on. There are commendable features about the three carbureters mentioned in your discussion above. We are not sure whether the Zenith or Stromberg will give you 30 miles to the gallon of gasoline. The mileage which you are obtaining now is somewhat better than most Ford drivers are getting and we cannot see therefore why there should be any dissatisfaction on this account.

IMPROVING CARBURETION OF 1911 STODDARD-DAYTON

Q—A 1911 Stoddard-Dayton car on which a vacuum tank and Rayfield carbureter was recently installed still uses a great amount of gasoline. Would it help to put in a hot spot manifold?

2—It is impossible to run the above mentioned car at slow speed because the engine jerks so. The car has to be run at a good speed to insure smooth riding. What is the reason for this and how can it be eliminated?—Bryan Smith, West Point, Nebr.

1—We feel that a hot spot manifold would help this condition out a good deal. A car of 1911 design cannot be expected to handle the fuel of to-day, which, in comparison with the gasoline of 1911 is extremely heavy.

2—This jerking action described is, no doubt, due to the loading of the intake

manifold. The heavy fuel separates out from the air currents because of its greater inertia when rounding the bends. Hot spotting is one way to help this condition partly, but we believe the most beneficial will be obtained by making a new manifold of slightly smaller sections, so that the gas velocity through the passages will be correspondingly increased.

ALLEN 41 CARBURETER ADJUSTMENT

Q—Explain carbureter adjustment of an Allen car model 41.—Lee Bivans, Latour, Mo.

1—A sectional view of the carbureter is shown in Fig. 12. The carbureter is provided with two adjustments. The nut "A" is the main adjustment and controls the mixture for any driving speed. This nut controls the gasoline supply from the float chamber (the gasoline is taken into the float chamber from the vacuum tank). If the nut "A" is turned to the left (anti-clockwise) the effect is to raise the needle from its seat and give more gas. If you turn the nut "A" to the right (clockwise) you are allowing less gas to pass by the needle.

In rare cases an entirely new adustment may be needed. In this instance turn the nut "A" to the right (clockwise) until the needle just seats, then open "A" three complete turns (to the left or anti-clockwise), which should give a mixture considerably rich.

Never adjust the carbureter to a cold engine. Start the engine and allow it to run a short time until it is thoroughly warmed up. On some occasions you may find it necessary to start the engine on a cold day and find "popping." Do not blame this on the carbureter and begin to adjust it. Wait until the engine has warmed up thoroughly, then if the popping continues it is time to consider an adjustment.

Carbureter adjustment for idling engine is effective only when the throttle is nearly closed. The gasoline for idling or low speed is taken in above the throttle and is controlled by mixing with air from the inside of the carbureter. This is regulated by screw "B," which should be between one-half and one and one-half turns to the left (anti-clockwise) from the seating position. After the engine is warm this may be regulated as necessary, turning to the right (clockwise) for more gas and to the left, or anti-clockwise, when less gas is required.

Miscellaneous

CHRISTIE FRONT WHEEL DRIVE

Q—Is the front wheel drive practical? Why was Christie's front wheel drive abandoned as a race car?—Fred E. Albright, T. E. Albright Buick Co., Crawfordsville, Ind.

The front wheel drive has proven practical as may be readily seen from the fact several very prominent trucks are using the drive on all four wheels. During the recent war the four wheel drive trucks made a decidedly successful operating record. The Christie front wheel drive racing car was probably abandoned because it wore out. The car made some wonderful records and Barney Oldfield made an unsuccessful attempt to break a record of the Chicago Speedway about three years ago. The car was in very poor condition at that time which probably accounts for its unsuccessful trial. The design of a car of this kind has not been followed by engineers in designing racing cars due perhaps to faults which they have found in its design. The steering of a car of this kind involves great difficulty and is a good reason why it will not be used on passenger cars.

DISTILLATE

Q—Have always been of the opinion that distillate was a lower grade fuel than either gasoline or kerosene. Am I correct?

2—What are the chief objections to burning distillate compared with kerosene?—J. A. Burke, Kingsley, Ia.

1—The distillate to which you refer is an unrefined product between gasoline and kerosene. Pound for pound the distillate has more heat units than gasoline. Distillate has been used extensively by motorists in California for several years. It can be used in most all gasoline engines to better advantage than kerosene for it has a lower boiling point and volitalizes more readily. The question as to successful results to be obtained from either distillate or kerosene is carburetion although it is probable that the distillate will not leave as much of a carbon deposit as kerosene.

2—See 1.

FOOLING WITH THE CAR

Q—I am greatly annoyed by boys climbing on the rear of my car, or fooling with the car when I am compelled to leave it alone; if this nuisance is not stopped in some way, fear an accident will occur. Would four dry cells underneath the seat, connecting them to a coil in such a manner that anyone touching the car while standing on the ground, would close the circuit and receive a slight shock—just enough to make it unpleasant to the touch?

2—How could this be done and would it be necessary to insulate the gasoline tank from the car to avoid fire?—W. J. Bowlby, Central Mercedita, Cuba.

1—An installation of this kind is not only impractical but would prove unsatisfactory as well. If you were in the car and sufficient strength was used to make the car unpleasant to touch, you would be annoyed by getting the shock yourself. The proper thing to do is to fit your car with locks which will eliminate any chance of accidents to any boys who might fool with the car.

SQUEAKING BRAKE

Q—After a brake had been installed on a car it would squeak. It has been taken apart again and would like to know how to clean the brake band.—Arthur Koenig, Terre Haute, Ind.

Maybe the rivets are too high, which cause them to make contact with the drum and so cause the squeak you are complaining of.

1920 NASH OIL CONSUMPTION

Q—A 1920 Nash car in which Mobile Arctic oil is used only gives 200 miles to a gallon. There doesn't seem to be a leakage of any kind and it doesn't seem like it pumps oil as it doesn't soot the plugs. Heavier oil cannot be used as it freezes in the crankcase. Can you advise what the trouble is?—Forrest W. Lewin, Galva, Ill.

This oil consumption does seem to be a bit heavy. If the engine is not inclined to smoke, and if you do not notice any oil drippings under the car when it is standing still, then how about the valve tappets. Is there any oil leaking out through the valve chamber. Is the outside of the engine covered with any oil film. There might be some very slight score marks in the cylinders which would cause the engine to consume slightly more oil. The exhaust would be emitting smoke constantly under these conditions, but it would not be very heavy, nor enough to cause the spark plugs to foul.

RACE DRIVERS

Q—What race drivers were killed in leading race meets since 1912?

2—Was Erwin Bergdoll killed and when?—W. R. Melaun, Dallas, Tex.

1—The list includes Bob Burman, Billy Pierce, Dave Buck, Al Livingston, Tom Kincaid, David Bruce Brown, Spencer Wishart and young Lecocq, who was burned to death at the Indianapolis race last year. George Buzane gave up his life for his country, and Johnny Aitken succumbed to pneumonia late last year.

2—Erwin Bergdoll is probably alive, although his whereabouts are not known, even to government officers who are seeking him on the charge that he evaded draft services; his brother Grover is in custody for the same offense.

INFORMATION ON 1916 DORT

Q—What is the gear ratio of the Dort 1916 model?

2—What is the speed of the 1916 Dort and the 1920 model of same car?

3—What is the speed of the Hudson, Winton, Pierce Arrow and Packard?

4—Has the Dort car enough power for wheels using 32x4 in. tires?—Ardell Bergseth, Peterson, Minn.

1—The gear ratio of the 1916 Dort is 4.1 to 1.

2—The size of the engine and gear ratio of these two models are very nearly alike. The car will develop about 55 m.p.h.

3—The speed of the cars is something which varies a great deal, and it is impossible for us to give anything definite. Under average conditions the above mentioned cars should attain a speed of about 75 m.p.h.

4—The question as to how much power is necessary to drive a car really has only an indirect relationship to the wheel size. The average amount of power used by motor cars is only about 15 hp., but of course the engines develop much more than this, but are very seldom called upon to make use of their maximum developed horsepower. Increasing the tire size to 32x4 in. will give you additional tractive effort and increase the speed a very small amount.

Law in Your Business

By Wellington Gustin

SEEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. MOTOR AGE presents here the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer, but presents it in such a way as to be readily understood by the layman. In addition to his articles, Mr. Gustin will gladly answer such individual inquiries on knotty points as may be submitted to him.

JUDGE MANTON ON CLAIMS OF THE BRINKMAN PATENT CONTENDING COOLING SYSTEMS FOR RADIATORS

WHAT IS HELD NEW AND INVENTION

THE INTERMEDIATE REFRIGERATING SECTION

Judge Manton of the United States District Court for Connecticut, recently passed upon claims of the Brinkman patent, for apparatus for cooling one fluid by another, and particularly the cooling of water pipes by means of air passages between them. The case relates to the action brought by the Whitlock Coil Pipe Company against the Mayo Radiator Company for infringement of patent. (257 Federal Reporter 752). The issue presented was one of non-infringement and invalidity.

The patent refers to the invention as an apparatus for effecting the cooling of one fluid by the application of another and cooler fluid, such as a cooling of air by water, or of water by air, and the condensation of steam by either air or water. The patentee says in his invention: "That portion of the apparatus to which my invention relates, in common with other and similar apparatus, comprises a series of air tubes surrounded with water passages forming part of a water-circulating system, by which the water which has become heated by its contact with the cylinder will lose its heat, and by its contact with the air tubes, through which, in order to increase the efficiency of the apparatus, the currents of the air are caused to move."

The patentee acknowledges in this passage that in the art prior to his invention there was cooling apparatus, comprising air tubes which are surrounded with water passages forming a part of the water-circulating system, the water of which has become heated, and which loses its heat by contact with air tubes. In addition the patentee claims that his invention simplifies the construction, decreases the weight, and reduces the cost of this class of refrigerating apparatus, and at the same time increases its efficiency.

These are the objects sought to be accomplished and he claims to succeed by building the section from a continuous strip of sheet metal, and the metal is crimped or corrugated, so that when the corrugated sheet is bent or returned upon itself at regular intervals, the corrugations will match and form the opposite sides of a tubular space for the passages of air.

Continuing, the court says the method of construction, according to the specifications, would indicate one continuous corrugated metal sheet, avoiding corners, and having a serpentine passage for the water. The series of air tubes arranged in a vertical row are formed by and between adjacent water space units by reason of the contacts at intervals of the oppositely disposed corrugations and the opposite surfaces of adjacent units. The construction of plaintiff's device consists of corrugating or crimping a continuous sheet, which is bent sharply and returned upon itself, with the corrugations of the two legs or plies of the fold coinciding with each other, thereby forming the first serpentine water passage as a physical unitary portion of the structure. These plies, when there are a sufficient number as required, make up the first unit portion of the structure.

The plies form folds or bends in a continuous sheet, and are brought into contact and soldered together; the tips of the bent sheet embracing this member are soldered at the bottom of the upper water chamber, and likewise the lower end of the section, into the lower water chamber.

The first claim of plaintiff "defines a combination of three elements, the upper water chamber, the lower water chamber, and the interposed refrigerating section. The refrigerating section consists of a continuous sheet of metal doubled upon itself in a series of folds, with the ends of the folded sections attached to the water chambers and inclosing a series of restricted water chambers, which connect at the ends of the folds with the water chambers.

"The second claim refers to the same structural features and specifies a continuous strip having offset edges, the one corrugated fold being separated from its companion ply by the offset edges to thereby form the serpentine passage between them. The third claim contains the same structural features, but does not require the sheet of metal to be a continuous strip. It does require the air-passages to be formed by the contacts of the inclosing walls of the air passage units."

The plaintiff sued on all its claims. Taking up the defendants' device, which is charged with being an infringement, the court found that it does not construct its water passages as structural units. The air passage columns constitute the structural units of its radiators. The water passages are incident to the assembly of the air space column. The defendant's structure embodies a greater number of strips, and greater number of joints to form the strips; they form the refrigerating section. It does not employ a continuous strip of corrugated sheet metal doubled upon itself in a series of folds, with the ends of folded sections attached to the water columns, to make up the refrigerating sections.

The folded sections are referred to by the plaintiff as sections of a continuous strip of sheet metal. The defendant's water passages are unrestricted, in that they are of equal cross-section from top to bottom, at the inlet and at the outlet. The water passages are not so shaped as to retard or restrict the flow of water, as the plaintiff's water passages are. The defendant's structure does not employ the feature of the claim found in the words of the patent in the series of parallel air passages between the water passages and transversely thereto and therefrom by the contact of such inclosing walls.

The defendant's structure forms water passages as straight walls from the top to the bottom, that is vertical and parallel. If the inclosing walls of the defendant's structure were brought in contact, they would close up all the air passages; but, to form the air passage, it has means to space the vertical straight inclosing walls of the water passage apart. They do not contact.

Therefore, the fins, comprising metal, in addition to the straight inclosing wall, are provided as shown in defendant's structure. Those fins permit a distinct mode of operation, and the heat ex-

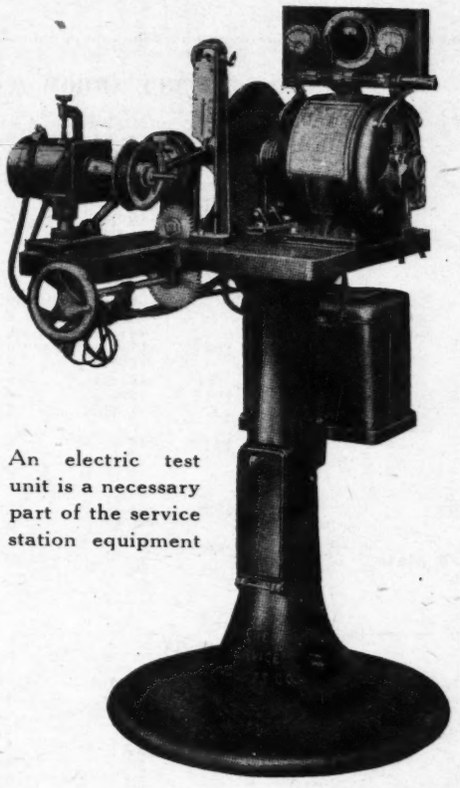
(*Continued on page 76*)

Service Equipment

Time Savers of the Shop

Burning-In and Running-In Machine

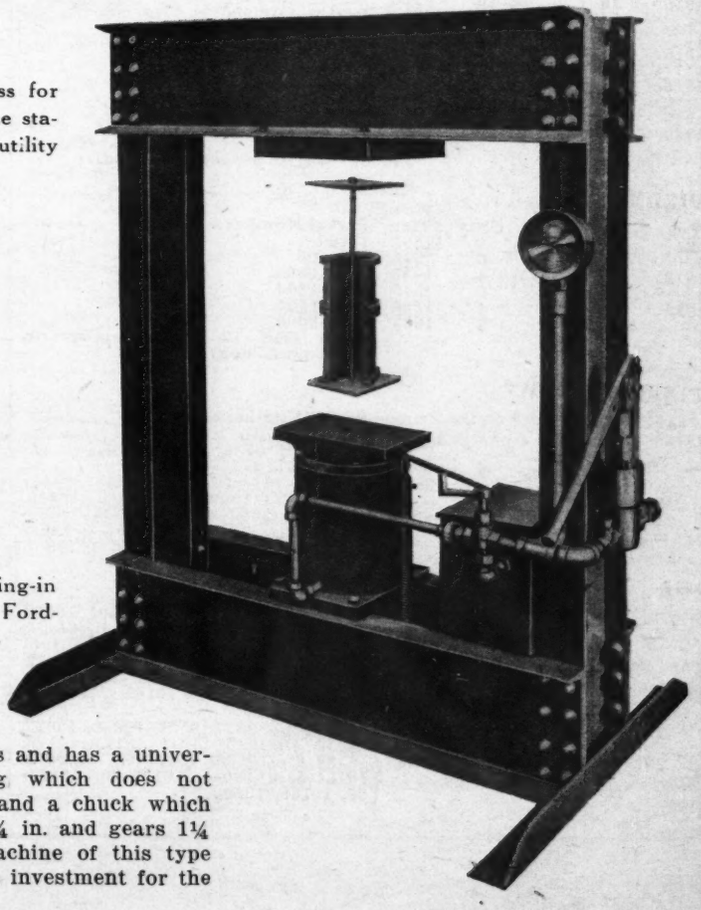
The service manager and dealer find that a great deal of the repair work requires burning-in of bearings. The machine shown in illustration possesses the advantage of either running-in or burning-in Fordson tractor and model T Ford engine as well as running-in practically any of the popular car motors. It is very difficult to turn over the crankshaft after cleaning the bearings and preparing cylinder block for burning-in the bearing, and for that reason there is provided a large hand wheel at the forward end of the driving disk which helps to line up driving pins with crankshaft disk. When burning-in bearings it is frequently desirable to turn over the crankshaft without throwing in the clutch. The hand wheel does not give sufficient leverage to do this and there is provided on the rear end of the machine a disk with several 1-in. holes in which a bar can be placed to pull over shaft. This machine has been designed for heavy duty and the main shaft is made of very high grade shaft steel, 2¼ in. in diameter. The speed at which a burning-in work can be done depends upon the skill of the operator, but it is claimed that a 90 per cent surface can be given to any set of main bearing in a few minutes. This machine is manufactured by Service Products Co., Springfield, Ohio.



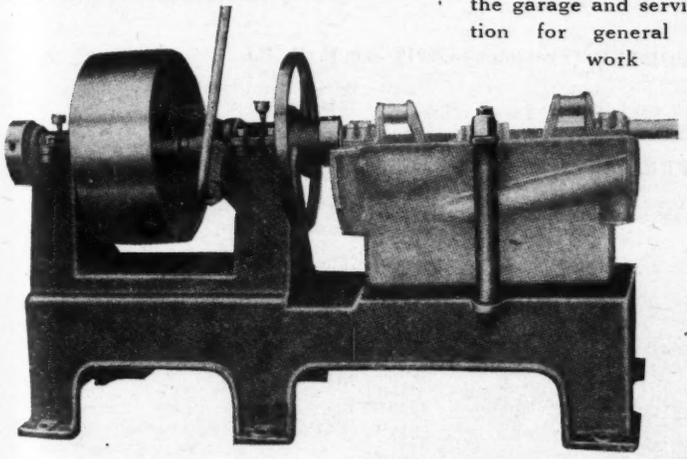
An electric test unit is a necessary part of the service station equipment

Lourie Hydraulic Garage Press

Every garage and service station particularly those doing a lot of truck and tractor repair work are always in need of a strong, substantial press to force pulleys and gears off and on shafts, to broach key ways in gears, for straightening shafts of bars, bending channels, angles or bars and many other things which might be mentioned. The machine shown in the illustration has a frame of structural steel, cross-ties that are steel channels and the uprights in a thirty-ton press are channels while those in a fifty and seventy-five ton press are I-beams. This press is easily operated and can be regulated to exert a small pressure or its full rated capacity. This press is manufactured by the Lourie Manufacturing Co., Springfield, Ill.



Lourie hydraulic press for the garage and service station for general utility work



Burning-in and running-in machine for Ford and Fordson engines or practically any engine

Electric Test Unit

This electric test unit is a universal machine, motor-driven, and has a variable speed ranging from 1 to 3000 in either direction of rotation. It is furnished with a double 6-volt battery, with a series multiple switch for testing both 6 and 12-volt generators and motors. It has a universal clamp for testing all types of motors and generators from 4 in. to 7 in. in diameter, also tests all types of magnetos and has a universal flexible coupling which does not cramp the bearings and a chuck which takes shafts $\frac{5}{16}$ to 1¼ in. and gears 1¼ in. to 3¼ in. A machine of this type would be a profitable investment for the service man because the electrical department is a very important branch of service station work and at present is greatly abused by poor mechanics and poorly equipped shops. This machine is manufactured by the Service Products Co., Springfield, Ohio.

Passenger Car Serial Numbers

Motor Age Maintenance Data Sheet No. 91

One of a series of weekly pages of information valuable to service men and dealers—save this page

PATERSON

Year	Model	Cyls.	Price	Serial Numbers
1912	G	4	$1600	4001-4425
	H	4	1850	
1913	45	4	.....	6001-6350
	47	4	1850	8001-8052
1914	33	4	1200	9300-9700
	32	4	1200	9010-9059
1915	6-48	6	1400	1000-1101
	4-32	4	1200	X100-X573
1916	6-42	6	995	301-1302
1917	6-45	6	.....	5001-6986
1918-19	6-46	6	.....	6869-9504
1920	6-47	6	.....	12001 up 12101 up

PATHFINDER

Year	Model	Cyls.	Price	Serial Numbers
1912	12	4	$1750	500-802
1913	13	4	2185	1000-1342
1914	14	4	2185	1500-1716
	14	6	2750	
1915	....	....	2222	2002-2566
	....	....	2750	
1916	Six	6	1695	2901-4175
	Twelve	12	2475	
1917	3-B	12	2750	8001-17525

Discontinued. Number on dash plate.

PEERLESS

Year	Model	Cyls.	Price	Serial Numbers
1912	33	4	$4300	12001-12900
	35	6	4000	121001-121296
	36	6	5000	122001-122439
	37	6	6000	123001-123068
1913	35	6	4300	131001-131251
	36	6	5000	132001-132386
	37	6	6000	120368-123123
1914	36	6	5000	142001-142589
	37	6	6000	143001-143058
1915	36	6	5000	152001-152100
	54	4	2000	DD101-DD2500
	55	6	2250	EE101-EE5000
1916	Series 1	8	1890	160001-169000*
1917	Series 2 & 3	8	1890	170001-179000
1918	Series 4	8	2340	230001 up
	*To March 21			
1919	Series 5	8	.....	260000 up
1920	Series 6	8	.....	

Since 1916 series models instead of yearly models adopted.

PIEDMONT

Year	Model	Cyls.	Price	Serial Numbers
1917	4-30	4	$1095	1-400
	6-40	6	1545	400-500
1918	4-30	4	1095	500-1000
	6-40	6	1545	1000-1200
1919	4-30	4	1235	1200-2500
	6-40	6	1685	2500-3000

After Dec. 15, 1919, number on main floor board.

PIERCE-ARROW

Year	Model	Cyls.	Price	Serial Numbers
1912	36 H. P.	6	$4000	32200-33200
				9199-9201-57
	48 H. P.	6	5000	9259-9321, 9323-9522
	66 H. P.	6	6000	9524-42, 9544-9667, 9669-9684, 9686-9769, 9771-10000, 10002-8, 10010, 10012-19, 10021-26, 10028-35, 10037-58, 10060-1, 10064-5, 10077-8, 10083 10088, 10095-10105, 10122, 10126-7, 66298-66500
1913	38-C	6	4300	33301-34050
	48-B	6	5000	10301-11125
	48-D	6	5000	9543, 9668, 9685, 9770, 10001, 10009, 10011, 10059, 10062-3, 10066-76, 10079-82, 10084-87, 10089-94, 10106-9, 10111-12, 10115-16, 10118-19, 10121, 10123-25, 10128-32, 10137, 10139-40, 10159, 10165, 10187-8, 10197-8
	48-D2	6	5000	9200, 9258, 9322, 9523, 10020, 10027, 10036, 10110, 10113-4, 10117, 10120, 10133-6, 10138, 10141-9, 10150-3, 10154-8, 10160-4, 10166-86, 10189-96, 10199, 10200

PIERCE ARROW (Continued)—

Year	Model	Cyls.	Price	Serial Numbers
	66-A1	6	6000	66601-66800
1914	38-C2	6	4300	34101-34603 and 34047
	48-B2	6	5000	11201-12100 and 11100
	66-A2	6	6000	66900-66964
1915	38-C3	6	4300	34701-35450
	48-B3	6	5000	12301-13050
	6-A3	6	6000	67050-67150
1916	38-C3	6	4300	35601-36350
	48-B3	6	5000	13051-13650
	66-A3	6	6000	67050-67150
	38-C4	6	4300	36601-37605
	48-B4	6	5000	13901-14900
	66-A4	6	6000	67201-67405
1917	38-C4	6	4300	37701-38701
	48-B4	6	5000	15001-16000
	66-A4	6	6000	67499-67800
1918	48-B4	6	5000	16001-16400
	48-B5	6	6500	16401-17400
1919	48 H. P.	6	7750	511001-511375 512001-512375 513001-513300
	38 H. P.	6	7250	311001-311375 312001-312375
1920	38 H. P.	6	.....	31301 up
	48 H. P.	6	.....	51401 up 51501 up

Number on plate below left front door; also stamped on cross frame member just behind motor.

PILOT

Year	Model	Cyls.	Price	Serial Numbers
1912	40	4	$1800	400-500
1913	40	4	2000	1400-1550
	50	4	2250	
	60	6	2500	
1914	50	4	2500	1551 1621
	60	6	2785	
1915	55	6	1885	1700-1755
1916	6-45	6	1100	1756-2070
	6-55	6	1685	
	8-55	8	1785	
1917	6-45	6	1150	2071-2999
1918	6-45	6	1295	3000-3575
1919	6-45	6	1650	3575 up

Number on left frame horn.

PORTER (Previous to 1919 see F. R. P.)

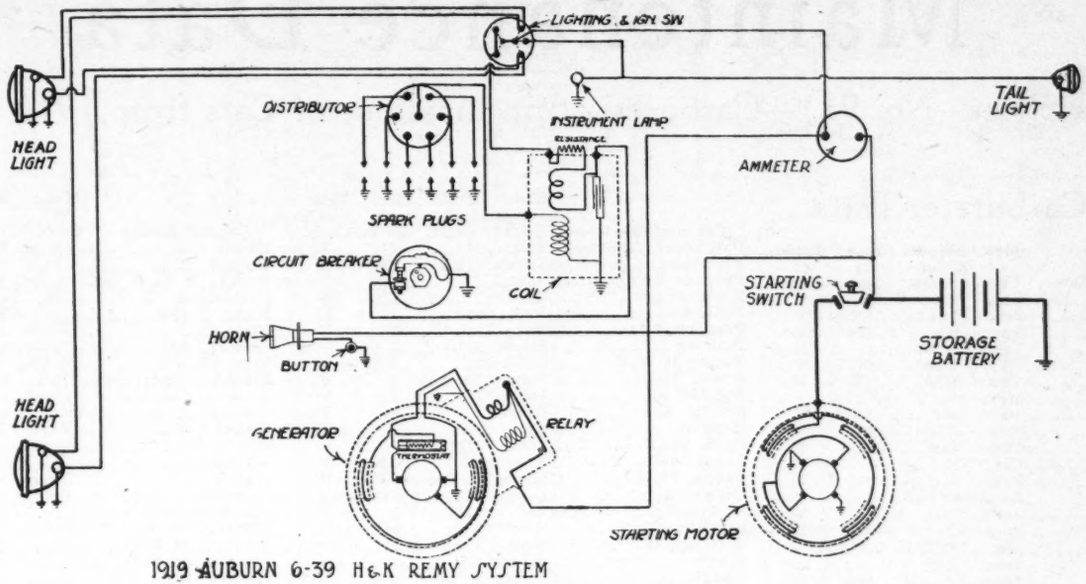
Year	Model	Cyls.	Price	Serial Numbers
1919-20	46	4	....	101-519

PREMIER

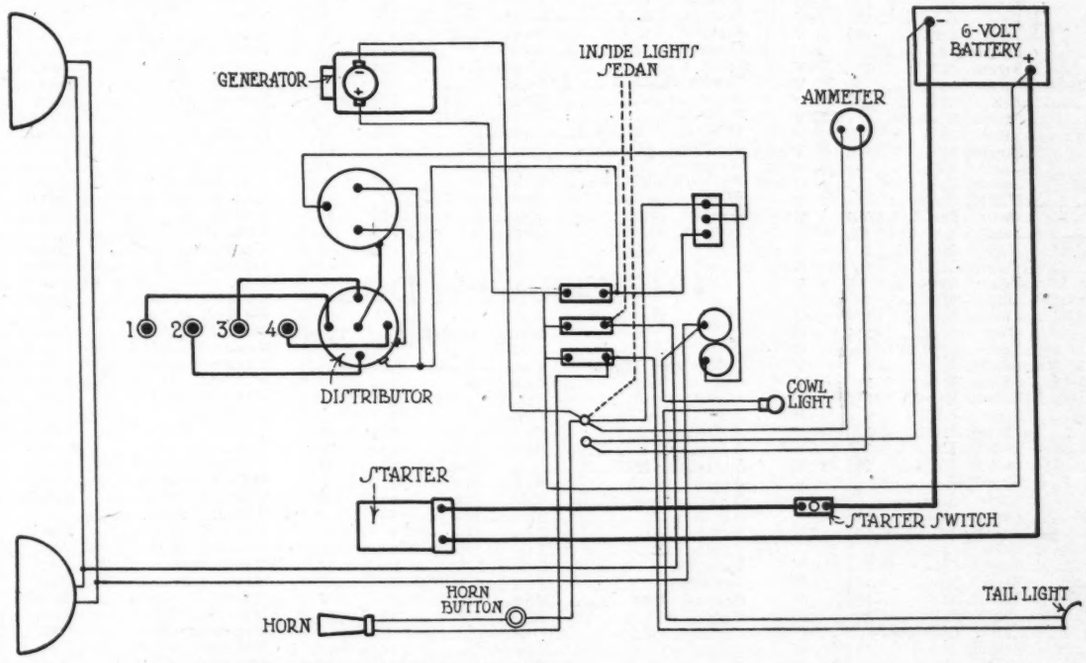
Year	Model	Cyls.	Price	Serial Numbers
1912	4-40	4	$3700	5000-7000
	6-60	6	4100	
1913	6-40	6	3900	7000-9000
	6-60	6	4200	
1913½	6-48	6	3700	10000-10499
	6-49	6	3800–3900	10500-11999
1914	A	6	3900	12000-13000
1915	6-50	6	3700–3900	65150-1615000
1916	6-51	6	3900	
1917	6B	6	3200–3400	0001-2912
1918	6C	6	3200–3710	3501-4511
1919	6C	6	3200–3400–3710	
1920	6D	6	.....	5001 up

1912 to 1916 inclusive, number left frame member, center and near step hanger.
1917 to 1919 inclusive, number under front cushion on left side, on right starting crank on front cross member, and on front spring hanger.

Motor Age Weekly Wiring Chart No. 71



1919 AUBURN 6-39 H&K REMY SYSTEM



1918 DIXIE FLYER MODEL H DYNETO

THIS WEEK

1918—Dixie Flyer

1919—Auburn

Allen—Dec. 18, '19
Auburn—Nov. 27, '19
Briscoe—Oct. 16, '19
Buick—Oct. 23, '19
Case—Oct. 2, '19
Crow-Elkhart—June 26, '19
Chalmers—Nov. 27, '19
Cutting—Nov. 6, '19
Daniels—Dec. 4, '19
Davis—Dec. 4, '19
Dorris—Dec. 11, '19
Dort—March 25, '20
Empire—Oct. 30, '19
Essex—Oct. 23, '19
May 15-22, '19
Franklin—June 19, '19; Dec. 11, '19
General Battery Charging—Sept. 25, '19
General Magneto Diagram—June 5, '19
Haynes—Oct. 9, '19
Hupmobile—Oct. 16, '19
Internal Connections—July 10-17-24, '19
Keeton—Nov. 6, '19
King—July 3, '19
Kissel—July 3, '19
Lexington—Jan. 1, '20
Liberty—Jan. 1, '20
Marmon—Dec. 25, '19; Jan. 22, '20
Maxwell—Aug. 14, '19
Mercer—Aug. 28, '19; Nov. 27, '19; March 25, '20
Mitchell—Jan. 8, '20
Monroe, Oct. 30, '19
Moon—Jan. 29, '20; March 11, '20
Moore—March 4, '20
Nash—March 11, '20
National—June 19, '19; Feb. 12, '20
Oakland—Oct. 16, '19
Olympian—Jan. 22, '20
Owen Magnetic—Sept. 18, '19
Packard—June 19, '19; July 31, '19; March 18, '19
Paige—July 3, '19
Paterson—June 26, 19; July 9, '19
Pierce-Arrow—Oct. 2, '19; Feb. 5, '20
Pilot—March 4, '20
Premier—Dec. 18, '19; Feb. 26, '20
Reo—Aug. 21, '19; Oct. 9, '19; Nov. 13, '19
Roamer—March 18, '20
Scripps-Booth—Jan. 15, '20
Stanley—June 26, '19
Stearns-Knight—Jan. 8, '20
Stephens—Feb. 12, '20
Studebaker—Dec. 25, '19
Stutz—Feb. 5, '20
Templar—Jan. 29, '29
Velie—Sept. 25, '19; Feb. 19, '20
Westcott—Jan. 15, '20
White—Sept. 25, '19; Feb. 19, '20
Willys-Knight—Feb. 26, '20
Special Systems for Fords—May 15-22, '19

Motor Age Summer Service Maintenance Data

(Data Sheet—No. 92)—Carbureter Specifications of Cars from 1916 to 1920

1916 Carbureter Data

Car and Model—	Make of Carb.	Model of Carb.	Size of Carb.	Type of Carb.
Abbott, 8-80	Zen.	CD5	1¼	V
Abbott, 6-44	Zen.	04	1⅛	V
Allen	Strom.	K1	1	V
Anderson	Zen.	HN4	1	H
Apperson, 6-16	Ray.	G3A	1¼	V
Apperson, 8-16	Ray.	L3A	1¼	V
Argo	May.	R	¾	V
Auburn, 6-38	Ray.	M2	1	V
Auburn, 6-40	Ray.	GL3	1	V
Austin	Strom.	H3	1½	V
Bell, A-16	Car.	H	1	V
Biddle, D	Zen.	HN5A	1¼	H
Brewster	Zen.	07Bs	1½	V
Briscoe, 8	Zen.	0D4	1	V
Briscoe, 4-38	May.	V	1	V
Buick, All	Marv.	D. & E.	1¼	V
Cadillac, 53	Own	.....	.....	...
Cameron	Zeph.	.....	1¼	...
Case, T	Own	.....	1¼	H
Chalmers, 35-A	Strom.	LB1	1	H
Chalmers, 32-B	Ray.	GL2A	1	V
Chandler, 16	Ray.	G3	1¼	V
Chevrolet, All	Zen.	04	1	V
Cole, 860	Strom.	H2	1¼	V
Crow-Elkhart, 30	Zen.	03½	⅞	V
Daniels, A	Zen.	05D	1¼	V
Detroiter, F	Scheb.	Spec. R	1	V
Dodge Brothers	Stew.	25	1	H
Dorris	Strom.	H3	1½	V
Dort, 5A	Car.	FO	¾	V
Empire, 45 & 60	Scheb.	T	1¼	H
Ford, T	H.&K.	Spec.	1⅛	V
Franklin	Own	Ser. 8	1 5/16	V
F. R. P.	Zen.	L8	2½	V
Glide, 6-40	Ray.	M2	1	H
Halladay, R-2	Strom.	HB1	1	H
Harvard, 4-20	Zen.	03½	⅞	V
Haynes, 34 & 35	Ray.	M3	1¼	H
Herff-Brooks, All	Strom.	H2	1¼	V
Hudson	Own	.....	1¾	H
Hupmobile	Zen.	HPCR	1¼	H
Inter-State, T & TR	Scheb.	R	1	V
Jackson, 34 & 3-48	Scheb.	R	1	V
Jackson, 68	Scheb.	R	1¼	V
Jeffery, 4	Strom.	LB2	1¼	H
Jeffery, 6	Strom.	HB1	1	H
King, E	B.& B.	DV4	1⅛	V
Kissel	Strom.	HB2	1¼	H
Klinekar, 6-36	Own	.....	.....	...
Lenox, D	Own	.....	.....	...
Lenox, O	Zen.	L5	1¼	V
Lexington	Scheb.	R	1¼	V
Locomobile, 38 & 48	Own	.....	.....	...
Lozier, 82	Ray.	G4	1½	V
Lozier, 84	Stew.	25	1½	V
Luverne, 7-60	Scheb.	R	1¼	V
Madison, T	Ray.	M2	1	H
Marion-Handley	Zen.	04&HP4A	1	V & H
Marmon, 34	Strom.	H3	1½	V
Maxwell	K-D	B	1	V
McFarlan, 6T & X	Strom.	H3	1½	V
Mecca, 30	Scheb.	R	1	V
Mercer, 22-72	Zen.	L7	1¾	V
Metz, 25	A.W.T.	.....	1	V
Mitchell, 6	Ray.	MR3	1¼	H
Mitchell, 8	Zen.	04D	1	V
Moline-Knight, 40	Scheb.	R	1¼	V
Moline-Knight, 50	Scheb.	R	1½	V
Monitor, C & R	Scheb.	.....	1	V
Monroe, M2	Zen.	03½	⅞	V
Moon, 6-30	Strom.	HB1	1	H
Moon, 6-40	Ray.	GL3	1¼	V
National, AC-6	Ray.	M3	1¼	H
National, AD-12	Ray.	G3F&GE	1¼	V
Oakland, 32	Marv.	2E	1	V
Oakland, 38	Marv.	3E	1¼	V
Oakland, 50	Strom.	H2	1¼	V
Oldsmobile, 43	Marv.	2E	1	V
Oldsmobile, 44	John.	D	1¼	V
Overland, 83	Till.	183	1	V
Overland, 83	Strom.	KO1	1	V
Overland, 86	Used various makes			
Owen Magnetic	Mast.	Junior	1½	H
Packard	Own	.....	1¾	...
Paige, 6-36	Strom.	HB1	1	H
Paige, 6-46	Ray.	M2	1	H
Partin Palmer	Scheb.	R	1	V
Paterson, 6-42	Strom.	HC31	1¼	H
Pathfinder, LaSalle	Strom.	H3	1¼	V
Pathfinder, 8-A-B & C	Strom.	HB3	1½	H
Peerless, 56	Spec.	.....	.....	...
Pierce-Arrow	Own	.....	.....	V
Pilot, 6-45	Ray.	M2	1	H
Premier, 6-51	Ray.	GL4	1⅛	V
Pullman	Strom.	MB1	1	H
Regal, D & E	Stew.	25	1⅛	V
Regal, F	Stew.	Duplex	1	V
Reo, M	John.	D	1¼	V
Reo, R	John.	F	1	V
Republic	Ray.	L2	1	H
Ross, C	Zen.	0D4	1	V
Saxon, S-2	Ray.	G2	1¼	V
Saxon, 14-15	Mayer	L. Spec.	¾	V
Scripps-Booth, C	Zen.	03½	⅞	V
Scripps-Booth, D	Zen.	0D4	1	V
Simplex, 50	Newc.	Spec.	2¼	...
Simplex, 46	Newc.	Spec.	2	...
Singer	Ray.	G5	1¾	V
Spaulding, H	Ray.	G3	1¼	V
Standard, 6	Zen.	0D5	1¼	V
Standard, 8	Ray.	GL4	1¼	V
Stearns, SKL4	Scheb.	Spec. R	1½	V
Stearns, SK-8	Ray.	G3P	1½	V
Studebaker	Scheb.	R	1¼	V
Stutz, C	Strom.	G3	1½	V
Trumbull, 16-B	Zeph.	.....	¾	...
Velie, 15	Strom.	HB2	1¼	H
Velie, 22	Strom.	HB1	1	H
Wayne, R & R4	Strom.	G2	1¼	V
Westcott, 41	Ray.	M2	1	H
Westcott, 51	Ray.	M3	1¼	H
Willys-Knight, 84	Till.	A	1	V
White	Own	.....	.....	...
Winton, 22	Ray.	G	1¾	V
Winton, 22-A	Ray.	G	1½	V

1917 Carbureter Data

Car and Model—	Make of Carb.	Model of Carb.	Size of Carb.	Type of Carb.
Abbott, 6-44	Zen.	04	1⅛	V
Aland, 14-60	Zen.	HW5	1¼	H
Allen	Strom.	M1	1	V
American, A	Zen.	HP5	1¼	H
Apperson, 6-17	Ray.	G3A	1¼	V
Apperson, 8-17	John.	D40	1¼	V
Auburn, 6-39	Ray.	M2	1	V
Auburn, 6-44	Ray.	M3	1¼	V
Austin, 12	Strom.	H3	1½	V
Bell, 17	Car.	H	1	V
Biddle, D	Zen.	HN5A	1¼	H
Bour-Davis	Strom.	LB1	1	H
Brewster	Zen.	L6B	1¾	V
Briscoe, 4-24	May.	S	1	V
Buick, All	Marv.	E2	1	V
Cadillac, 55	Own	.....	.....	...
Cameron	Zen.	.....	1¼	...
Case, T-40	Ray.	M3	1¼	H
Chalmers, 6-30	Strom.	LB1	1	H
Chandler, 17	Ray.	G3	1¼	V
Charter Oak. A	Ray.	GL4	1½	V
Chevrolet, 490, F-5, F-2	Zen.	04	1	V
Chevrolet, D	Zen.	04D	1	V
Cole, 860	Strom.	H2	1¼	V
Crow-Elkhart, CE 35	Zen.	03½	⅞	H
Cunningham, V	Strom.	H3	1½	V
Daniels	Zen.	05D	1¼	V
Detroiter, 6-45	B.& B.	SH1	1	V
Dixie Flyer	Car.	F	1	V
Dodge Brothers	Stew.	G4	1⅛	H
Dorris	Strom.	H3	1½	V
Dort, 9	Car.	H	1	V
Drexel, R 30 & 35	Strom.	MB1	1	H
Drummond, B-17	Zen.	05D	1¼	V
Elcar, D-E-F	Car.	F	1	V
Elgin	Strom.	LB1	1	H
Empire, All	Strom.	H1	1	V
Ford, T	H.&K.	Spec.	1⅛	V
Franklin, Series 9-A	Own	Ser. 9-A	1	V
F. R. P., 45 A & B	Long.	Spec.	2½	V
Geneva	Ray.	GL4	1½	V
Glide, 6-40	Ray.	M2	1	H
Grant, K	Strom.	LB1	1	H
Hackett	D.B'K	AH	1	H
Hal	Strom.	H3	1½	V
Harroun	Bell	A	1	...
Harvard, 2-T	Zen.	03½	⅞	V
Hatfield, H	Strom.	K1	1	V
Haynes, 36 & 37	Ray.	M3	1¼	H
Haynes, 40 & 41	Ray.	G3P	1¼	V
Hollier, 186	Stew.	Spec.	1	V
Hollier, 178	Stew.	Spec.	1¼	V
Homer-Laughlin, D	Ens.	G	¾	H
Hudson	Own	.....	1¾	H
Hupmobile, N	Zen.	HP5CR	1¼	H
Inter-State, T	Scheb.	R	1	V
Jackson, 349	Zen.	04D	1	V
Jeffery, 472	Strom.	L2	1¼	V
Jeffery, 671	Ray.	M2	1	H
Jones, 26	Strom.	L2	1¼	V
Jordan, B	Strom.	LB2	1¼	H
King, E E	B.& B.	DV4	1⅛	V
Kissel, 6-42	Strom.	HB2	1¼	H
Klinekar, 6-38-F	Ray.	M2	1	H
Lambert, 80 & 90	Scheb.	T	1¼	H
Laurel, 35	Scheb.	R	1	H
Lexington, 6-0-17	Ray.	M2	1	H
Lexington, 6P	Strom.	G3	1¼	V
Liberty, 10-A	Ray.	M2	1	H
Locomobile, 38 & 48	B.& B.	Spec.	1¾	V
Luverne, 17	Scheb.	R	1¼	V
Madison	Ray.	M2	1	H
Maibohm, A	Zen.	03½	⅞	V
Marion-Handley, 6-40	Strom.	LB1	1	H
Marion-Handley, 6-60	Strom.	LB2	1¼	H
Marmon, 34	Strom.	H3	1⅛	V
Maxwell, 25	K-D	B	1	V
McFarlan	Strom.	H3	1½	V
Mercer, 22-73	Zen.	L7	1¾	V
Metz, 25	A.W.T.	.....	1	V
Mitchell, C-42 & D-40	Ray.	MR3	1¼	H
Moline-Knight, C	Scheb.	R	1¼	V
Moline-Knight, G	Scheb.	TA	1¼	H
Monitor, All		LB1	1	H
Monroe, M-3	Zen.	03½	⅞	V
Monroe, M-4	Zen.	HP5	1¼	H
Moon, 6-43	Ray.	M2	1	H
Moon, 6-66	Ray.	M3	1¼	H
Moore	Scheb.	R	1¼	V
Murray, 70-T	Zen.	OD5	1¼	V
Napoleon, 30	Car.	O	1	...
National, AE-6	Ray.	M3	1¼	H
National, AF-6	Ray.	M3	1¼	H
National, AK-12	Ray.	GLP4	1¼	V
Oakland, 50	Marv.	2E	1	V
Oakland, 34		D	1	V
Oldsmobile, 45	John.	.....	.....	...
Overland, 90	Till.	AD	1	H
Overland, 85-4	Till.	185-4	1	H
Overland, 85-6	Till.	C185-6	1	H
Owen Magnetic, M-25	Zen.	HN5	1½	H
Owen Magnetic, O-36	Zen.	L5S	1½	V
Packard, 225-235	Own	.....	1¾	V
Paige, 6-38	Ray.	M2	1	H
Paige, 6-46	Ray.	M3	1¼	H
Partin-Palmer, 20	Scheb.	R	1	V
Partin-Palmer, 32	Car.	A	1	V
Paterson, 6-45	Strom.	LB1	1¼	H
Pathfinder	Strom.	H3	1½	V
Peerless, 56	B.& B.	DV	1½	V
Phianna, M	H.&N.	.....	1½	...
Pierce-Arrow, 38-C-4	Own	.....	.....	V
Pierce-Arrow, 48-B-4	Own	.....	.....	V
Pierce-Arrow, 66-A-4	Own	.....	.....	V
Pilot, 6-45	Zen.	HN4A	1¼	H
Premier, 6-B	John.	1981	1¼	V
Princess, 4-36-F	Scheb.	R	¾	V
Pullman, 424-32	Strom.	MB1	1	H
Regal, J	Car.	F01	1	...
Regal, F	John.	.....	1¼	...
Reo, R	John.	D	1	V

Abbreviations: — Amer., American; B. & B., Ball & Ball; Car., Carter; D. B'k., Dave Buick; Ens., Ensign; Holl., Holley; John., Johnson; King., Kingston; Long., Longuemare; Marv., Marvel; Mast., Master; May., Mayer; Mill., Miller; Newc., Newcomb; Ray, Rayfield; Reic., Reicherbach; Scheb., Schebler; Shak., Shakespeare; Stew., Stewart; Strom., Stromberg; Till., Tillotson; Zeph., Zephyr; Zen., Zenith.

H—Horizontal.

V—Vertical.

(Carbureter Specifications for Cars from 1916 to 1920—Cont'd)

Car and Model—	Make of Carb.	Model of Carb.	Size of Carb.	Type of Carb.
Reo, M	Ray.	G3	1½	V
Richmond, 6-17	Strom.	HB2	1¼	H
Roamer	Strom.	LB2	1¼	H
Ross, C	Zen.	0D4	1	V
Saxon, S-4	Ray.	M3	1¼	H
Saxon, B-5-R	Reic.	Spec.	¾	...
Scripps-Booth, D	Zen.	0D4	1	V
Simplex	Newc.	Spec.	1½	...
Singer, 17	Ray.	G5	1¾	V
Standard, E & F	Zen.	0D5	1¼	V
Stearns, SKL-4	Scheb.	Spec.	1¼	V
Stearns, SK-8	Ray.	G3P	1¼	V
Stephens, 60-65	Strom.	LB1	1	H
Studebaker, SF	Scheb.	R	1¼	V
Studebaker, ED	Scheb.	R	1¼	V
Stutz, R	Strom.	H3	1½	V
Sun, 17	Ray.	M3	1¼	H
Templar, 445 & 645	Zen.	04	1	V
Velie, 27	Strom.	LB2	1¼	H
Velie, 28	Strom.	LB1	1	H
Westcott, S-17	Ray.	M3	1¼	H
Willys-Knight, 88-4	Till.	188-4	1¼	H
Willys-Knight, 88-8	Zen.	0D4	1	V
Willys Six, 88-6	Till.	186-B	1¼	H
White	Own	.....	.....	...
Winton, 22	Ray.	G	1¾	V
Winton, 22-A	Ray.	G	1½	V
Woods Dual Power	Zeph.	.....	¾	...
Yale	Zen.	0D4	1	V

1918 Carbureter Data

Car and Model—	Make of Carb.	Model of Carb.	Size of Carb.	Type of Carb.
Abbott	Strom.	LB2	1¼	H
Allen, 41	Strom.	M1	1	V
American, B	Zen.	HP4	1	H
Anderson	Zen.	HP4	1	H
Apperson, 6-18	Ray.	G3A	1¼	V
Apperson, 8-18	John.	D40	1¼	V
Auburn, 6-39	Ray.	M2	1	V
Auburn, 6-44	Ray.	M3	1¼	V
Austin	Strom.	H3	1½	V
Biddle, H	Zen.	HP5A	1¼	H
Bour-Davis, 18-A	Mill.	Spec.	1	V
Bour-Davis, 18-B	Strom.	LB2	1¼	H
Brewster	Zen.	L6B	1¾	V
Briscoe, 4-24	D.B'k.	ABSpec.	1½	H
Buick, E-4-34 & 35	Marv.	Spec.3E	1¼	V
Buick, E-6-44, 45, 46, 49 & 50	Marv.	Spec.3E	1¼	V
Cadillac, 57	Own	.....	.....	....
Campbell	Amer.	.....	1	....
Case, U	Ray.	M3	1¼	H
Chalmers, 6-30	Strom.	L2	1¼	V
Chandler	Ray.	G3	1¼	V
Chevrolet, 490	Zen.	04	1	V
Chevrolet, D	Zen.	04D	1	V
Cole, 870	Strom.	H2	1¼	V
Columbia C & D	Strom.	LB2	1	H
Comet, C-50	Mill.	Spec.	1¼	V
Commonwealth, 6-40	Car.	L	1	H
Crawford, 6-40	Strom.	LB2	1¼	H
Crow-Elkhart, K36	Zen.	04	1	H
Cunningham, V-3	Strom.	H3	1½	V
Daniels	Zen.	05D	1¼	V
Davis, H	Strom.	LB1	1	H
Davis, J	Strom.	LB2	1¼	H
Disbrow Special, A	Mill.	Spec.	1¾	V
Dixie Flyer	Car.	F	1	V
Dodge Brothers	Stew.	25	1	H
Dorris	Strom.	H3	1½	V
Dort, 9	Car.	H	1	V
Elcar, 4	Car.	L0	1	H
Elcar 6	Strom.	LB1	1	H
Elgin, F	Strom.	LB1	1	H
Empire, 50, 51, 71, 73	Strom.	MB1	1	H
Empire, 70A	Strom.	H1	1	V
Essex, A	Own	.....	.....	...
Fageol	Zen.	08D	1½	V
Ford, T	H.&K.	Spec.	1⅛	V
Franklin, 9-B	Own	Ser. 9-B	1	V
F. R. P., 45B	Stew.	Spec.	2	V
Geronimo, A-45	Strom.	LB2	1¼	H
Ghent, 6-80	Strom.	L2	1¼	V
Glide, 6-40	Ray.	M2	1	H
Grant, G	Strom.	LB1	1	H
Hackett	Buick	.....	1	H
Hal, 21-A	Strom	H3	1½	V
Harroun	Strom.	M1	1	V
Harvard, 4-20	Zen.	03½	⅞	V
Hatfield, A	Zen.	04	1	V
Haynes, 38 & 39	Ray.	M3	1¼	H
Haynes, 44	Ray.	G3P	1¼	V
Hollier	Stew.	25	1	V
Hudson, M	Own	.....	1¾	H
Hupmobile, R	Strom.	M1	1	V
Inter-State, T	Scheb.	R	1	V
Jackson	Zen.	04D	1	V
Jones, 27	Strom.	.....	.....	....
Jordan	Strom.	LB2	1¼	H
King, EE	B.& B	DV4	1⅛	V
Kissel, 6-42	Strom.	LB1	1	H
Kissel	Strom.	H3	1½	V
Klinekar, 6-38	Ray.	M2	1	H
Lexington, R	Ray.	M2	1	H
Liberty, 10-B	Strom.	LB1	1	H
Locomobile, 38 & 48	B.& B.	Spec.	1¾	V
Madison	Ray.	M2	1	H
Maibohm, A	Zen.	03½	⅞	V
Maibohm, B	Strom.	LB1	1	H
Marion Handley, A	Strom.	LB1	1	H
Marion Handley, B	Strom.	LB2	1¼	H
Marmon, 34	Strom.	H3	1½	V
Maxwell, 25	John.	375	1	H
McFarlan, X	Strom.	H3	1½	V
Mercer	Zen.	L7	1¾	V
Metz, 25	A.W.T.	.....	1	V
Mitchell, 6-42	Strom.	LB2	1¼	H
Mitchell, D-40	Ray.	MR3	1¼	H
Moline-Knight, C & G	Scheb.	T	1¼	H
Monitor, U & O	Strom.	LB1	1	H
Monroe, M-3	Zen.	03½	⅞	V
Monroe, M-6	Zen.	HP5A	1¼	H
Moon, 6-36	Till.	C	1	V
Moon, 6-45	Ray.	M2	1	H
Moon, 6-66	Ray.	M3	1¼	H
Moore, 30	Scheb.	RL	1¼	V
Moore, 30-E	Scheb.	R	1	V
Nash, 681 & 683	Marv.	3E	1¼	V
Nash, 671	Ray.	M3	1¼	V
Nash, 684	Marv.	E	1¼	V
National, AF3-6	Ray.	M3	1¼	H
National, AK2-12	Ray.	GLP4	1½	V
Oakland, 34-B	Marv.	2E	1	V
Oldsmobile, 37	John.	D	1¼	V
Oldsmobile, 45-A	B.& B.	DV	1⅛	V
Olympian	Strom.	MB1	1	H
Overland, 85-4	Till.	C	1	H
Overland, 85-6	Till.	C185-6	1	H
Overland, 90	Till.	A0	1	H
Owen Magnetic, W-42	Zen.	L5S	1½	V
Packard, 325 & 335	Own	.....	1¾	V
Paige, 6-39	Strom.	LB1	1	H
Paige, 6-55	Ray.	M3	1¼	H
Pan American	Ray.	M2	1	H
Paterson, 6-46	Strom.	LB1	1¼	H
Peerless, 56	B.& B.	DV	1⅛	V
Pennsy	Car.	L	1	H
Phianna, M	H.&N.	.....	1½	...
Pierce-Arrow	Own	.....	.....	V
Pilot, 6-45	Till.	C2B	1	H
Premier, 6-C	John.	B2209	1¼	V
Regal, J	Car.	F01	1	...
Reo, M	Ray.	GL3	1½	V
Roamer, D-75 & C-54	Strom.	LB2	1¼	H
Roamer, D-90	Strom.	L3	1½	V
Saxon, B5	Scheb.	R	1	V
Saxon, S4	Strom.	LB1	1	H
Sayers	Zen.	HP4A	1	H
Scripps-Booth, G	Zen.	04	1	V
Scripps-Booth, H	Zen.	0D4	1	V
Seneca, D	Scheb.	R	1	V
Shadwick, A & B	Mill.	Spec.	1	V
Simplex, V	Newc.	Spec.	1½	...
Singer, 18	Ray.	G5	1¾	V
Standard, G	Zen.	0D5	1¼	V
States, C	Shak.	Std.	1	V
Stearns, SKL-4	Scheb.	Spec.	1½	V
Stearns, SK-4	Ray.	G3P	1¼	V
Stephens, 70	Strom.	LB2	1¼	H
Studebaker, EG, EH & SH	Scheb.	R	1¼	V
Stutz, S	Strom.	H3	1½	V
Templar, 445	Zen.	L5	1¼	V
Velie, 38 & 39	Ray.	M3	1¼	H
Westcott, All	Ray.	M3	1¼	H
Willys-Knight, 88-4	Till.	188A	1¼	H
Willys-Knight, 88-8	Zen.	0D4	1	V
White, GM	Own	.....	.....	...
Winton, 22	Ray.	G	1¾	V
Winton, 22-A	Ray.	G	1½	V
Wolverine	Mill.	Spec.	1¾	V
Woods-Dual Power	Strom.	MB1	1	H
Yale, M	Zen.	0D4	1	V

1919 Carbureter Data

Car and Model—	Make of Carb.	Model of Carb.	Size of Carb.	Type of Carb.
Allen, 41	Strom.	M1	1	V
American, B	Zen.	HP4	1	H
Anderson	Zen.	HP4	1	H
Apperson, 8-19	John.	D40	1¼	V
Argonne	Ray.	M3V	1¼	H
Auburn, 6-39	Ray.	M2	1	V
Beggs, 19T	Strom.	LB1	1	H
Biddle, H	Zen.	HP5A	1¼	H
Bour-Davis, 18-B	Strom.	.....	1¼	H
Bour-Davis, 20	Strom.	.....	1	H
Brewster	.....	.....	.....	....
Briscoe, 4-24	D.B'k.	ABSpec.	1½	H
Buick, H	Marv.	Spec.3E	1¼	V
Cadillac, 57	Own	.....	.....	....
Case, U	Ray.	M3	1¼	H
Chalmers, 6-30	Strom.	L2	1¼	V
Chandler	Ray.	G3	1¼	V
Chevrolet, 490	Zen.	04	1	V
Chevrolet, FA	Zen.	05	1¼	V
Chevrolet, D	Zen.	04D	1	V
Cole, 870	Strom.	H2	1¼	V
Columbia	Strom.	LB1	1	H
Comet	Ray.	M3	1¼	V
Commonwealth, 4-40	Car.	L	1	H
Crawford	Strom.	LB3	.....	....
Crow-Elkhart, K-36	Zen.	04	1	H
Cunningham, V-3	Strom.	H3	1½	V
Daniels	Zen.	05D	1¼	V
Davis, 6H	Strom.	LB1	1	H
Dixie Flyer	Car.	A	1	V
Dodge Brothers	Stew.	25	1	H
Dorris, 6-80	Strom.	L3	1½	V
Dort, 11	Car.	H	1	V
Elcar, 4	Car.	L0	1	H
Elcar, 6	Strom.	LB2	1¼	V
Elgin, H	Strom.	LB1	1	H
Essex, A	Own	.....	.....	...
Ford, T	H.&K.	Spec.	1⅛	V
Franklin, Series 9-B	Own	Ser. 9-B	1	V
Geronimo	.....	.....	.....	....
Grant	.....	.....	.....	....
Hanson, 45A	Strom.	L1	1	V
Harroun, A1	Strom.	M1	1	V
Hatfield, A	Zen.	04	1	V
Haynes, 45	Ray.	M3	1¼	H
Haynes, 46	Ray.	G3P	1¼	V
Hollier, 198	Stew.	25P	1	V
Hollier, 206	Stew.	25K	1	V
Holmes	Newc.	Spec.	1	V
Hudson, O	Own	.....	1¾	H
Huffman, W	Strom.	LB1	1	V
Hupmobile, R	Strom.	M1	1	V
Jackson	Zen.	04D	1	V
Jones, 28	Ray.	M3	1¼	H
Jordan, F	Strom.	LB2	1¼	H
King	B.& B.	DV4	1⅛	V
Kissel	Strom.	LB2	1¼	H
Klinekar, 6-42-H	Ray.	M2	1	H
Leach	Ray.	M3V	.....	H
Lexington	Ray.	M2	1	H
Liberty, 10-B	Strom.	LB1	1	H
Locomobile	B.& B.	Spec.	1¾	V
Maibohm, B	Strom.	LB1	1	H
Marmon, 34	Strom.	H3	1½	V
Maxwell, 25	John.	Spec.	1	H
McFarlan	Strom.	H3	1½	V
Mercer	B.& B.	.....	1½	V
Metz, Master Six	Strom.	MB1	1	V
Mitchell	.....	.....	.....	...
Moline-Knight, L	Scheb.	T	1¼	H
Monitor, M & O	Strom.	LB1	1	H
Monroe, S9	Zen.	J25T	1¼	H
Moon, 6-36	.....	.....	.....	...
Moon, 6-66	.....	.....	.....	...
Moore, 30-C	K-D	.....	1	...
Nash	Marv.	3E	1¼	V
National, AL-6	Ray.	M3	1¼	H
National, AM-12	Ray.	GLP4	1½	V
Nelson	Zen.	.....	1	...
Noma	Zen.	HP4A	1	H
Oakland, 34B	Marv.	2E	1	V
Oldsmobile, 37A	John.	A	1¼	...
Oldsmobile, 45A	B.& B.	DV	⅛	V
Overland, 90	Till.	C	1	H
Owen Magnetic, W-42	Zen.	L5S	1½	V
Packard, 325 & 335	Own	.....	1¾	...
Paige, 6-40	Strom.	LB1	1	H
Paige, 6-55	Ray.	M3	1¼	H
Pan American, 6-40	Ray.	M2	1	H
Paterson, 6-47	Strom.	LB1	1¼	H
Peerless, 56	B.& B.	DV8	1⅛	V
Phianna, R	H.T.N.	.....	1½	...
Piedmont, 4-30	Car.	F0	1	V
Pierce-Arrow, 48	Own	.....	.....	V
Pilot, 6-45	Till.	C2B	1	H
Premier, 6-C	John.	B2209	1¼	V
Reo, T & U	John.	A	1	V
Revere	Strom.	M4	1½	V
Roamer, C-54	Strom.	LB2	1¼	H
Saxon, Y-18	Strom.	LB1	1	H
Sayers	Zen.	HP4A	1	V
Scripps-Booth	Marv.	2E	1	V
Seneca, H	Scheb.	R	1	V
Singer, 19	Ray.	G5	1¾	V
Standard, H	Zen.	0D5	1¼	V
Stearns, SKL-4	Scheb.	Spec.	1¼	V
Stephens, 80	Till.	C12A	1¼	...
Studebaker, EG&EH	B.& B.	SV	1½	V
Studebaker, SH	Scheb.	R	1¼	V
Stutz, G	Strom.	H3	1½	V
Templar, 445	Zen.	L5	1¼	V
Tulsa, D	Zen.	D4	1	V
Velie, 38	Ray.	M2	1	H

Abbreviations: — Amer., American; B. & B., Ball & Ball; Car., Carter; D. B'k., Dave Buick; Ens., Ensign; Holl., Holley; John., Johnson; King., Kingston; Long., Longuemare; Marv., Marvel; Mast., Master; May., Mayer; Mill., Miller; Newc., Newcomb; Ray, Rayfield; Reic., Reicherbach; Scheb., Schebler; Shak., Shakespeare; Stew., Stewart; Strom., Stromberg; Till., Tillotson; Zeph., Zephyr; Zen., Zenith.

H—Horizontal.
V—Vertical.

(Carbureter Specifications for Cars from 1916 to 1920—Cont'd.)

Car and Model—	Make of Carb.	Model of Carb.	Size of Carb.	Type of Carb.
Velie, 39	Ray.	M3	1¼	H
Westcott, A-38	Ray.	M2	1	H
Westcott, B-38	Ray.	L3P	1¼	V
Willys-Knight, 88-4	Till.	188-4	1¼	H
Winton, 24	Strom.	L3	1½	V
Winton, 25	Strom.	O3	1½	V

1920 Carbureter Data

Car and Model—	Make of Carb.	Model of Carb.	Size of Carb.	Type of Carb.
Allen, 43	Strom.	M1	1	V
American, B	Strom.	HP1	1	V
Anderson, 30	Ray.	L3P	1¼	H
Apperson, Anniv	John.	805A	1¼	---
Apperson, 8-20	John.	105A	1¼	---
Argonne	Ray.	.....	1½	V
Auburn, 6-39	Ray.	M2	1	H
Beggs, 20T	Strom.	LS2	1¼	V
Bell	Strom.	.....	1	---
Biddle, B-1	Zen.	HP5A	1¼	H
Bour-Davis, 20	Strom.	.....	1	H
Bour-Davis, 21	Zen.	.....	1¼	---
Brewster	Strom.	LS2	1¼	V
Briscoe, 4-34	Buick	.....	1	H
Buick, 45-49	Marv.	E	.....	---
Cadillac, 59	Own	.....	1½	V
Case, V	Ray.	M3	1¼	V
Chalmers	Strom.	.....	1¼	V
Champion	Zen.	.....	1	V
Champion Special	Car.	.....	1	H
Chandler	Ray.	G3	1¼	V
Chevrolet, 490	Zen.	04	1½	V
Chevrolet, FB	Zen.	04	1½	V
Cleveland, 40	Strom.	MB1	1	H
Cole, 870	John.	M12	1½	V
Columbia, C	Strom.	LB1	1	H
Comet, C-53	Strom.	LB2	1¼	H
Commonwealth	Car.	L	1	H
Crawford	Strom.	LB3	.....	---
Crow-Elkhart, H-55	Zen.	HP4S	1	H
Crow-Elkhart, L-55	Zen.	04	⅞	V
Cunningham, V3	Strom.	L-Spec.	1½	V
Daniels, D	Zen.	0D5	1¼	V
Davis, 51	Strom.	LS2	1¼	V
Dixie Flyer, H-S-50	Strom.	.....	1	H
Dodge Brothers	Stew.	25	1⅛	---
Dorris, 6-80	Strom.	L3	1½	V
Dort, 15	Car.	L	1	H
du Pont, A	.....	.....	.....	---
Economy, 6-46	Zen.	HP4A	1	H
Elcar, 4	Strom.	M1	1	V
Elcar, 6	Strom.	L2	1¼	V
Elgin, K	Strom.	LB1	1	H
Essex, A	Own	.....	1¼	H
Ferris, C-20	Zen.	HP5A	1 7/16	V
Ford, T	Holl.	H	1	H
Franklin, Series 9-B	Own	Ser. 9-B	1	V
Gardner, S	Car.	LO	1	V
Geronimo, 6A-45	Strom.	LB1	1	H
Grant, H	Strom.	L	1	V
Hanson, 54	Marv.	.....	1¼	V
Harroun, A-A-2	Strom.	M1	1	V
Hatfield, A	Zen.	HP5B	1	H
Haynes, 45	Ray.	M3	1¼	H
Haynes, 46	Ray.	G3P	1¼	V
H. C. S	.....	.....	.....	---
Hollier, 206-B	Zen.	4HP	1	V
Holmes	Newc.	E	1	V
Hudson, O	Own	.....	1¾	H
Huffman, R	Strom.	LS2	.....	H
Hupmobile, R-3	Strom.	M1	1	V
Jackson, 7W	Strom.	LB1	1	H
Jackson, 7R	Strom.	L6-2	1¼	V
Jones, 28	Ray.	M3	1¼	H
Jordan, F	Strom.	LB2	1¼	H
Jordan, M	Strom.	LB2	1¼	V
Kenworthy	.....	.....	.....	---
King, H	B.& B.	DV10	1¼	V
Kissel, 45	Strom.	LB2	1¼	V
Klinekar, 6-55-J	Ray.	L3P	1¼	H
LaFayette	Own	.....	2	V
Leach, 20-A	Ray.	M3V	.....	H
Lexington, S-20	Ray.	L3P	1¼	V
Liberty, 10-C	Strom.	L1	1	V
Locomobile, 48	Own	.....	1¾	V
Lorraine	John.	A	1	V
Maibohm, B	Till.	C	1	H
Marmon, 34	Strom.	HS	1½	H
Marshall, K	Zen.	.....	1	---
Maxwell, 25	John.	.....	1	---
McFarlan, 127	Strom.	H3	1½	V
Mercer, Series 5	B.& B.	SV22	1½	V
Meteor, K & R	Zen.	L	1½	H
Metz, Master Six	Strom.	MB1	1	V
Mitchell, F-40	Ray.	MR3	1¼	H
Monitor, M & Ser. 3	Strom.	LS2	1¼	V
Monroe, S9	Zen.	J25T	1¼	H
Moon, 6-48	Ray.	PL3	1¼	H
Moon, 6-68	Ray.	G2	1¼	---
Moore, 30	Marv.	E	1	V
Murray	.....	.....	.....	---
Nash	Marv.	E	1¼	V
National, Sextet BB	Ray.	GLP4	1½	V
Nelson, D	Zen.	.....	1	V
Norma, 1C	Zen.	05R	1¼	V
Oakland, 34C	Marv.	E	1	---
Ogren	Opt.	.....	1½	---
Oldsmobile, 37A	John.	A	1¼	V
Oldsmobile, 45-A	Ball	.....	1¼	---
Overland, 4	Till.	.....	1	V
Owen Magnetic, 60	Zen.	L6	1½	V
Packard, 335	Own	.....	1½	V
Paige, 6-42	Strom.	MB1	1	H
Paige, 6-55	Ray.	M2	1¼	---
Pan American, 6-48	Ray.	M3	1½	H
Parenti, H	Zen.	.....	1	H
Paterson, 6-50	Strom.	LS2	1¼	H
Peerless, 56	B.& B.	DV12	1¼	H
Phianna, R	Strom.	.....	1½	---
Piedmont, 4-30	Car.	LO	1	H
Piedmont, 6-40	Strom.	LB	1	H
Pierce-Arrow, 38	Own	.....	1¾	V
Pierce-Arrow, 48	Own	.....	2	V
Pilot, 6-45	Till.	C	1	H
Porter, 45	Zen.	.....	2	V
Premier, 6-D	John.	Spec.	1¼	H
Reo, T6 & U6	Ray.	LL3P	1½	V
Reo, F	John.	A	1	V
ReVere, C	Strom.	M4	1¾	V
Roamer, 6-54	Strom.	LB2	1¼	H
R & V Knight, R	Scheb.	AH	1¼	H
R & V Knight, J	Scheb.	AH	1¼	H
Saxon, 125	Strom.	M2	1¼	V
Sayers, 6	Zen.	HP4A	1	V
Scripps-Booth, B	Marv.	.....	1	V
Seneca, L	Scheb.	R	1	V
Singer, 20	Strom.	03	1½	V
Skelton, 35	Car.	L	1	H
Spacke, S-19 & S-20	Car.	LO	1	H
Standard, I	Zen.	0D5	1¼	V
Stearns, SKL4	Scheb.	R	1¼	V
Stephens, 80	Till.	C12A	1¼	H
Stevens-Duryea, E	Strom.	03	1½	V
Studebaker, EH	Strom.	LS2	1¼	V
Studebaker, EG	B.& B.	.....	1½	V
Studebaker, EJ	Strom.	LS2	.....	---
Stutz, H	Strom.	H3	1½	V
Templar, 445	Strom.	M2	1¼	V
Texan, A-38, B-38	Car.	L	1	V
Tulsa, E	Zen.	HP5B	1¼	H
Velie, 34	Ray.	.....	.....	H
Velie, 48	Ray.	L3P	1¼	---
Wasp	Strom.	L3	1¾	V
Westcott, C-38	Ray.	L3P	1¼	V
Westcott, C-48	Ray.	M3	1¼	H
Willys-Knight, 20	Till.	.....	1	---
Winther	Strom.	.....	1	---
Winton, 25	Strom.	03	1½	V

Abbreviations: — Amer., American; B. & B., Ball & Ball; Car., Carter; D. B'k., Dave Buick; Ens., Ensign; Holl., Holley; John., Johnson; King., Kingston; Long., Longuemare; Marv., Marvel; Mast., Master; May., Mayer; Mill., Miller; Newc., Newcomb; Ray., Rayfield; Reic., Reicherbach; Scheb., Schebler; Shak., Shakespeare; Stew., Stewart; Strom., Stromberg; Till., Tillotson; Zeph., Zephyr; Zen., Zenith.

H—Horizontal.

V—Vertical.

LAW IN YOUR BUSINESS

(*Continued from page 70*)

change between fluids. The radiation is referred to in defendant's device as half direct and half indirect, for the fins are not in contact with the water, nor are they inclosing walls. They, in defendant's device, form the air passages.

In practice and in construction, the complainant patentee does not make a continuous sheet, but makes a series of sheets, which, when put together, might be considered a continuous sheet.

"In other words, there has never been made with any commercial success, a structure which conforms to the specifications and claims in this suit," said the court. "It would be unfair to claim that the defendant's device infringes plaintiff's device, when the latter has added no substantial value to the art. To sustain the claim of infringement would be to interpret the language of the claim as broad enough to include a successful structure. Claims should cover what the patentee has invented and nothing more."

Concluding its opinion, the court said: "The general combination of air upper and lower water chambers in a refrigerating section, interposed between, and connecting at its ends with the chambers, were common in the art of coolers, condensers, and radiators prior to the date of the Brinkman patent. All that may be said to be invention by the Brinkman patent was in the intermediate refrigerating section. But Brinkman does not claim as his invention the refrgerating section, but claims the combination of elements of which the refrigerating section is only one.

"Therefore, so far as the claimed combination is concerned, it makes no difference whether one of its elements is new or old; the combination remains the same. The plaintiff has failed to establish infringement."

WALSH TAKES OVER TAYLOR TRUCK

Detroit, March 31—Freemont Motor Corp., headed by R. T. Walsh, advertising manager of King Motor Car Co. and composed of Detroit manufacturers, has taken over the plant and assets of the Taylor Motor Truck Co., at Freemont, Ohio, and will build a six-cylinder passenger car. Final steps in the deal came yesterday in an order from the federal court in Toledo, directing the receiver of the Taylor company to sell the assets of the new corporation.

The corporation is capitalized at $2,000,000, all common stock of the par value of $10, $250,000 of which will be put on the market. The car to be manufactured will sell at $1850, and will be equipped with a Falls engine and of standard construction. The new owners take formal control of the property today, and expect to be in production within a few weeks. The output of the plant for 1920 has been contracted for on an export order.

HAS "BARGAIN DAY" FOR USED CARS

Atlanta, Ga., March 27—There have been special bargain sales of every kind in various lines of industry, but a special sale of used automobiles is something entirely new, at least in this section of the country. Recently such a sale was conducted in Atlanta by the Parker-Holland Co., the sale lasting for one week. The purchaser could buy a used car, and if it did not prove entirely satisfactory at the end of forty-eight hours' usage, he could return it and get his money back. The sale proved a big success.

Index to Motor Age Maintenance Data Sheets

IN order to facilitate the reference work to the Maintenance Data pages that have been published in MOTOR AGE, an index is given herewith. The dealer in his summer service work finds it necessary often to replace some standard part and having a complete library of information of all these standard parts, with an itemized index to accompany same, he will undoubtedly save much time.

It is recommended that this index be preserved along with the Motor Age Maintenance Data Sheets.

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Belt Speed Chart	10	Oct. 31, 1918
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	35	April 24, 1919
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	37	May 22, 1919
	38	May 29, 1919
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Circles, circumferences and areas	5	Dec. 29, 1918
Decimal equivalents and metric conversions	11	Nov. 7, 1918
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Engine and car speed chart	39	June 5, 1919
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	17	Dec. 19, 1918
	18	Dec. 26, 1918
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	2	Sept. 5, 1919
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	60	Oct. 30, 1919
	61	Nov. 6, 1919
	62	Nov. 13, 1919
	63	Nov. 20, 1919
	64	Nov. 27, 1919
	65	Dec. 4, 1919
	66	Dec. 11, 1919
	67	Dec. 18, 1919
	68	Dec. 25, 1919
	69	Jan. 1, 1920
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	71	Jan. 8, 1920
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	73	Jan. 15, 1920
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	75	Jan. 22, 1920
	76	Jan. 22, 1920
	77	Jan. 29, 1920
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	83	Feb. 12, 1920
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Serial numbers of Passenger cars	21	Jan. 16, 1919
	22	Jan. 22, 1919
	23	Jan. 30, 1919
	24	Feb. 6, 1919
	25	Feb. 13, 1919
	26	Feb. 20, 1919
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	79	Jan. 29, 1920
	80	Feb. 5, 1920
	82	Feb. 12, 1920
	84	Feb. 19, 1920
	86	Feb. 27, 1920
	87	March 4, 1920
	88	March 11, 1920
	89	March 18, 1920
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Spark plug sizes	6	Oct. 3, 1918
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Tire and Wheel Standard Data	45	July 17, 1919
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	49	Aug. 14, 1919
	50	Aug. 21, 1919
	51	Aug. 28, 1919
	52	Sept. 4, 1919
	53	Sept. 11, 1919
	54	Sept. 18, 1919
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	56	Oct. 2, 1919
Wire, weight of	38	May 29, 1919
Wire and Sheet gages	38	May 29, 1919
Wheel and Tire Standard Data	(See Tire and Wheel Standard Data)	

Motor Age Monthly Passenger Car Specification Tables

These prices apply to five and seven-passenger models only.

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. HP.	Carbureter Size and Make	Gear Ratio	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model
Allen 43	5	1495	110	32x4	Miller	3½x5	Own	4	19.6	1 —Strom.	4.63	B. and B.	Own	Detroit	Columbia	Ditweiler	Stewart	Firestone	6–8	90	U. S. L.	West.	West.	.....	6–8	Allen 43
American	7	1865	122	32x4	.....	3½x5	Ruten.	..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	....	.....	.....	.....	.....	...	American
American Beauty	5	2450	121	33x4	Firestone	3¼x5	H-S	6	25.35	1½—Ray.	4.90	B. and B.	Detroit	Acme	Timken	Standard	Warner	Firestone	6	110	Willard	West.	West.	A-K	6	American Beauty
Anderson Series 30	7	....	120	33x4	Goodrich	3½x4½	Cont.	6	25.35	Ray.	4.50	B. and B.	Durston	Ther-H	Salisbury	Jacox	Stewart	Firestone	6	90	Willard	Remy	Remy	Remy	6	Anderson Series 30
Apperson Anniversary	7	4250	130	34x4½	U. S.	3½x5	Own	8	33.80	1½—John.	4.25	Own	Own	Sterling	Own	Own	V. Sicklen	Firestone	6	110	Willard	Bijur	Bijur	Remy	6	Apperson Anniversary
Apperson 8-20	7	3250	130	34x4½	Goodyear	3½x5	Own	8	33.80	1½—John.	4.25	Own	Own	Sterling	Own	Own	V. Sicklen	Firestone	6	110	Willard	Bijur	Bijur	Remy	6	Apperson 8-20
Argonne	4	4750	128	32x4	Goodrich	3½x5½	Own	4	22.50	—Ray.	.....	Own	Own	Opt.	Stan-Par	Gemmer	Waltham	Houk	12	15	Exide	West.	Own	Eise.	12	Argonne
Auburn 6-39	5	1895	120	33x4	Goodrich	3½x4½	Cont.	6	25.35	1—Ray.	4.66	B. and B.	G-L	Hart.	Col.	Jacox	Stewart	Firestone	6	80	Willard	Remy	Remy	Remy	6	Auburn 6-39
Beggs 6	5	1935	120	33x4	Goodrich	3½x4½	Cont.	6	25.35	1—Strom.	.....	B. and B.	Detroit	Arvac.	Stan-Par	Ditweiler	Stewart	Firestone	6	100	Exide	A-L	A-L	Conn.	6	Beggs 6
Bell	5	1495	114	31x4	Miller	3½x4½	C. B. & S.	4	22.50	1—Strom.	.....	.....	Muncie	Hart	Peru	Warner	Stewart	Firestone	6	.....	Prest.	A-L	.....	A-K	6	Bell
Biddle B-5	6	3950	125	32x4	Firestone	3½x5½	Buda	4	22.50	1½—Zen.	4.50	Warner	Warner	Spicer	Stan-Par	Gemmer	Warner	.....	6	90	Phila.	G. & D.	G. & D.	Simms	6	Biddle B-5
Bour Davis 20	5	1750	118	32x4	Goodyear	3½x4½	Cont.	6	25.35	1—Strom.	4.75	B. and B.	Detroit	Mehanics	Salisbury	C. A. S.	Stewart	Perlman	6	125	Willard	Remy	Remy	Remy	6	Bour-Davis 20
Bour-Davis 21 S. & R.	7	2375	126	33x4½	Goodyear	3½x5½	Cont.	6	29.40	1½—Zen.	.....	Muncie	Muncie	Spicer	Salisbury	C. A. S.	Stewart	Firestone	6	115	Willard	West.	West.	West.	6	Bour-Davis 21 S. & R.
Brewster	4	9000	125	34x4½	Kelly-S	4x5½	Own	4	25.80	1½—Strom.	4.50	Own	Own	Own	Own	Own	Stewart	Firestone	12	80	U. S. L.	U. S. L.	U. S. L.	Berl.	.....	Brewster
Briscoe 4-34	5	1185	109	31x4	optional	3½x5	Own	4	18.23	1—Buick #	4.18	Own	Own	Own	Own	Own	Stewart	Hayes	6	80	Prest.	A-L	A-L	Conn.	6	Briscoe 4-34
Buick H-45	5	1495	118	33x4	Goodyear	3½x4½	Own	6	27.34	—Mar.	4.00	Own	Own	.....	Own	Own	A-C	Own	6	80	Willard	Delco	Delco	Delco	6–8	Buick H-45
Buick H-49	7	1785	124	34x4½	Goodyear	3½x4½	Own	6	27.34	—Mar.	4.00	Own	Own	.....	Own	Own	A-C	Own	6	80	Willard	Delco	Delco	Delco	6–8	Buick H-49
Cadillac 59	7	3740	132	35x5	optional	3½x5½	Own	8	31.25	1½—Own*	5.08	Own	Own	Spicer	C-Timk.	Own	V. Sicklen	Kelsey	6	.....	Exide	Delco	Delco	Delco	6–3	Cadillac 59
Case V	7	2650	126	34x4½	Goodyear	3½x5½	Cont.	6	29.40	1¼—Ray.	4.45	B. and B.	G-L	Arco	Col.	Jacox	V. Sicklen	Firestone	6	118	Willard	West.	West.	Delco	6	Case V
Chalmers 35-C	5	1795	117	32x4	optional	3½x4½	Own	6	25.35	.....	.....	Own	Own	.....	.....	Own	.....	.....	6	106	.....	.....	.....	.....	6	Chalmers 35-C
Chalmers 35-B	7	1945	122	33x4½	optional	3½x4½	Own	6	25.35	.....	.....	Own	Own	.....	.....	Own	.....	.....	6	106	.....	.....	.....	.....	6	Chalmers 35-B
Champion C-4	5	1250	116	32x3½	Goodrich	3½x5	Lyco	4	19.60	1—Zen.	4.25	B. and B.	G-L	.....	Peru	C. A. S.	Stewart	Stanweld	6	.....	Willard	Delco	Delco	Delco	6	Champion C-4
Champion S-4	5	1395	118	32x4	Goodrich	3½x5	H-S	4	19.60	1—Carter	4.25	B. and B.	G-L	.....	Peru	C. A. S.	V. Sicklen	Stanweld	6	.....	Prest.	Dyn.	Dyn.	A-K	6	Champion S-4
Chandler	7	1895	123	33x4	Goodrich	3½x5	Own	6	29.40	1½—Ray.	4.40	B. and B.	Own	Hartford	Own	Gemmer	Stewart	Firestone	6	120	Prest.	G. & D.	G. & D.	Bosch	6	Chandler
Chevrolet 4-90	5	795	102	31x4	Goodyear	3½x4	Own	4	21.76	1½—Zen. #	3.63	Own	Own	Own	Own	Warner	Stewart	Perl-Jack.	6	80	Willard	A-L	A-L	Simms	6	Chevrolet 4-90
Chevrolet F. B.	5	1295	110	33x4	Goodyear	3½x5½	Own	4	21.76	1½—Zen.	4.62	Own	Warner	Own	Own	Warner	Stewart	Perl-Jack.	6–8	120	Willard	A-L	A-L	Simms	6	Chevrolet F. B.
Cleveland 40	5	1385	112	32x4	Goodrich	3x4½	Own	6	21.60	1—Strom.	4.45	B. and B.	Mechanics	Mechanics	Own	Ditweiler	V. Sicklen	Firestone	6	94	Prest.	G. & D.	G. & D.	Bosch	6	Cleveland 40
Cole Aero Eight 870	7	2850	127	33x5	Firestone	3½x4½	North.	8	39.20	1½—John.	4.45	North.	North.	Spicer	Col.	Gemmer	Warner	Firestone	6	50	Prest.	Delco	Delco	Delco	6	Cole Aero Eight 870
Columbia C	5	1795	115	32x4	Firestone	3½x4½	Cont.	6	25.35	1—Strom.	4.75	B. and B.	Durston	Spicer	Timken	Gemmer	Stewart	Firestone	6	80	Prest.	A-L	A-L	A-K	6	Columbia C
Comet C-53	5	2350	125	33x4½	Firestone	3½x5½	Cont.	6	29.40	1½—Strom.	4.66	B. and B.	Muncie	Arvac	Col.	Gemmer	Stewart	Firestone	6	120	Willard	Wagner	Wagner	Wagner	6	Comet C-53
Commonwealth 4-40	5	1395	117	32x4	Goodrich	3½x5	Lyco.	4	19.60	1—Carter	4.25	B. and B.	G-L	Detroit	Peru	C. A. S.	V. Sicklen	Stanweld	6	105	Prest.	Dyn.	Dyn.	A-K	6	Commonwealth 4-40
Crawford 20-6-40	7	3000	122½	32x4	.....	3½x5½	Cont.	6	29.40	—Strom.	.....	.....	.....	.....	Timken	Gemmer	.....	Firestone	...	....	.....	.....	West.	Bosch	....	Crawford 20-6-40
Crow-Elkhart L-55-4	5	1395	117	32x3½	Firestone	3½x5	Lyco.	4	19.60	⅞—Zen.	.....	B. and B.	Covert	Ther-H	Peru	Ditweiler	Stewart	Jaxon	6	80	Exide	Dyn.	Dyn.	Conn.	6	Crow-Wlkhart L-55-4
Crow-Elkhart H-55-6	5	1645	117	33x4	Firestone	3½x5	Ruten.	6	23.4	—Zen.	.....	B. and B.	Covert	Ther-H	Peru	Ditweiler	Stewart	Jaxon	6	80	Exide	Dyn.	Dyn.	Conn.	6	Crow-Elkhart H-55-6
Cunningham V-3	7	....	132	35x5	optional	3½x5	Own	8	45.00	1½—Strom.	4.08	B-L	Own	Spicer	Timken	Gemmer	Warner	Firestone	6	120	Willard	West.	West.	Delco	6	Cunningham V-3
Daniels D	7	4850	132	34x4½	optional	3½x5½	Own	8	39.20	1¼—Zen.	4.40	Own	Own	Spicer	Timken	Gemmer	Stewart	Firestone	6	145	Willard	Delco	Delco	Delco	6	Daniels D
Davis 51	5	2185	120	33x4	.....	3½x4½	Cont.	6	25.35	1¼—Strom.	4.75	B. and B.	Warner	Peters	Timken	Warner	Stewart	Firestone	6	80	Willard	Delco	Delco	Delco	6	Davis 51
Dixie Flyer H-S-70	5	1465	112	32x4	Fisk	3½x5	H-S	4	19.60	1—Strom.	4.72	B. and B.	G-L	Ther H	Peru	C. A. S.	V. Sicklen	Standard	6	80	Willard	Dyn.	Dyn.	Eise.	6	Dixie Flyer H-S-70
Dodge Brothers	5	1085	114	32x3½	optional	3½x4½	Own	4	24.03	1¼—Stew.	4.16	Own	Own	Own	Own	Own	J. Man.	Kelsey	12	50	Willard	N. E.	.....	Own	12	Dodge Brothers
Dorris 6-80	7	4350	132	33x5	Goodyear	4x5	Own	6	38.40	1½—Strom.	3.50	Warner	Warner	Spicer	Timken	Ross	V. Sicklen	.....	6	103	Willard	West.	West.	Bosch	6	Dorris 6-80
Dort 15	5	1035	105½	30x3½	Goodyear	3½x5	D-Lyco	4	19.60	1—Carter	4.07	Own	Mechanics	Mechanics	Flint	Jacox	Stewart	Cleveland	6	95	U. S. L.	West.	West.	Conn.	6	Dort 15
du Pont A	5	4000	124	32x4½	Goodrich	3½x5½	Own	4	24.75	1¼—Strom.	4.45	B-L	B-L	Spicer	Col.	Jacox	Stewart	Firestone	6	105	Exide	West.	West.	Eise.	6	du Pont A
Economy 6-46	5	1795	115	33x4	.....	3½x4½	Cont.	6	25.35	1—Zen.	4.50	B. and B.	Durston	.....	Salisbury	Ditweiler	Stewart	Firestone	6	90	Willard	A-L	A-L	Conn.	6	Economy 6-46
Elcar 6	5	1795	116	33x4	Firestone	3½x4½	Cont.	6	25.35	1¼—Strom.	4.50	B. and B.	Muncie	Peters	Salisbury	C. A. S.	Stewart	Stanweld	6	90	Willard	Delco	Delco	Delco	6	Elcar 6
Elcar 4	5	1495	116	33x4	Firestone	3½x5	Lyco.	4	19.60	1—Strom.	4.50	B. and B.	Muncie	Peters	Salisbury	C. A. S.	Stewart	Stanweld	6	90	Willard	Delco	Delco	Delco	6	Elcar 4
Elgin Series K	5	1665	118	33x4	optional	3½x4½	Falls	6	23.44	1—Strom.	5.09	B. and B.	Mechanics	Mechanics	Col.	C. A. S.	V. Sicklen	Firestone	6	90	Willard	Wagner	Wagner	Wagner	6	Elgin Series K
Essex A	5	1545	108½	32x4	optional	3½x5	Own	4	18.23	1¼—Own	5.09	Own	Own	Spicer	Timken	Gemmer	Stewart	Kelsey	6	105	Exide	Delco	Delco	Delco	6	Essex A

Engines—Ruten., Rutenber; Cont., Continental; Weid., Weidely; North., Northway; H-S., Herschell-Spillman; Lyco., Lycoming; D-Lyco., Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-McTeetor-McFarlan; #, Monson or Duesenberg; R. & V., Root & Van Dervoort. **Carburetor**—Strom., Stromberg; Zen., Zenith; Ray., Rayfield; John., Johnson; Mar., Marvel; Sund., Sunderman; Stew. Stewart; H-K., Holley-Kingston; Newc., Newcomb; Scheb., Schebler; Tillot., Tillotson; Johns., Johnston. Fuel feed vacuum except where otherwise indicated. *Pressure. #Gravity. **Generator and Motor**—A-L., Auto-Lite; West., Westinghouse; #, Westinghouse or Auto-Lite; W-L., Ward-Leonard; Dyn., Dyneto; N. E., North East; L-N., Leece-Neville; A-C., Allis-Chalmers; Split., Splitdorf; S-H., Simms-Huff; G. & D., Gray & Davis. **Ignition**—A-K., Atwater-Kent; Conn., Connecticut; Eise., Eisemann; West., Westinghouse; Will., Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W., Bosch-Westinghouse; Split., Splitdorf. **Gearset**—G-L., Grant-Lees; North., Northway; B-L., Brown-Lipe. **Rear Axle**—Col., Columbia; W-Weiss, Walker-Weiss; C-Timk., Cadillac-Timken; West-Mott, Weston-Mott. **Universals**—Hart., Hartford; Ther-H., Thermoid-Hardy; U. M. Co., Universal Machine Co. **Speedometer**—J-Man., Johns-Manville; V-Sicklen, Van Sicklen; A-C., Allis-Chalmers.

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. HP.	Carburetor Size and Make	Gear Ratio	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model
Fergus	6	....	126	32x4	.....	3½x5	.....	6	25.35	—Zen.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Bijur	Bijur	Delco	.....	Fergus
Ferris	6	3390	130	32x4½	Firestone	3½x5½	Cont.	6	29.40	—Zen.	.....	B. and B.	G-L	Peters	Col.	Gemmer	Warner	Firestone	6	120	Willard	L-N	L-N	L-N	6	Ferris
Fiat	7	....	136	35x5	.....	.....	Own	6	.....	—Own	4.75	.....	Own	Own	Own	Own	Stewart	.....	12	60	Own	Own	Own	Marelli	.....	Fiat
Ford T	5	575	100	30x3½	.....	3¾x4	Own	4	22.50	1—H-K#	3.63	Own	Own	Own	Own	Own	.....	.....	6	80	None	Own	Own	Own	6	Ford T
Franklin 9-B	5	2850	115	32x4	Goodyear	3½x4	Own	6	25.35	1—Own	4.33	B. and B.	Own	Own	Own	Own	Stewart	.....	12	60	Willard	Dyn.	.....	A-K	12	Franklin 9-B
Gardner	5	1125	112	32x3½	Goodyear	3½x5	Own	4	19.60	1—Carter	.....	B. and B.	Mechanics	Peters	W-Weiss	Ditweiler	Stewart	Jaxon	6	87	Willard	West.	West.	West.	15	Gardner
Geronimo	5	1995	122	32x4	Goodyear	3½x5	Ruten.	6	23.44	1—Strom.	.....	B. and B.	G-L	Hart	Flint E	C. A. S.	Stewart	Firestone	6	88	Willard	Dyn.	Dyn.	Delco	6	Geronimo
Grant H-X	5	1595	116	32x4	optional	3 7/8x4½	Walker	6	22.52	1—Strom.	4.63	B. and B.	Durston	Spicer	Columbia	Jacox	V. Sicklen	Firestone	6	90	Prest.	Bijur	Bijur	A-K	6	Grant H-X
Hanson 54	5	2165	119	32x4	optional	3½x4½	Cont.	6	25.35	1¼—Mar.	.....	B. and B.	Covert	Detroit	Timken	Gemmer	Stewart	Kelsey	6	80	Prest.	Delco	A-L	Remy	6–8	Hanson 54
Harroun A-A-2	5	995	106	30x3½	Miller	3½x5½	Own	4	16.90	1—Strom.	4.00	Own	G-L	Own	Adams	Lavine	Stewart	Stanweld	6	80	Prest.	Remy	Remy	Remy	6	Harroun A-A-2
Harvard 4-20	2	850	100	28x3	.....	3x4½	.....	4	14.40	⅞—Zen.#	.....	.....	.....	Blood	.....	Barnes	.....	.....	6	.....	Nat'l	Wagner	Wagner	A-K	6–3	Harvard 4-20
Hatfield A-42	5	1695	115	32x4	Firestone	3½x5	H-S	4	16.90	1—Zen.	.....	B. and B.	G-L	Spicer	Col.	.....	Stewart	Firestone	6	.....	Willard	Dyn.	Dyn.	Conn.	6	Hatfield A-42
Haynes 46	7	3450	127	34x4½	optional	2¾x5	Own	12	36.30	1¼—Ray.	4.07	B. and B.	Own	Arvac	Own	Jacox	Warner	Houk	6	120	Willard	L-N	L-N	Delco	6	Haynes 46
Haynes 45	7	2685	127	34x4½	optional	3½x5	Own	6	29.40	1½—Ray.	4.42	B. and B.	Own	Arvac	Own	Jacox	Stewart	Firestone	6	120	Willard	L-N	L-N	King	6	Haynes 45
H. C. S. Special	4	2950	120	32x4½	Goodrich	3⅞x5½	Weid.	4	21.03	.....	.....	.....	.....	.....	Own	.....	.....	.....	.....	.....	.....	Delco	.....	Delco	.....	H. C. S. Special
Hollier 206-B	5	1985	120	33x4	Goodrich	3½x4½	Cont.	6	25.35	1—Zen.	4.41	Fuller	Fuller	Own	Own	Warner	Stewart	Firestone	6	80	U. S. L.	West.	West.	West.	6	Hollier 206-B
Holmes	7	3100	126	34x4½	Goodyear	3½x4½	Own	6	29.40	1—Newc.	4.90	B-L	B-L	Spicer	Timken	Gemmer	V. Sicklen	Firestone	12	100	Willard	Dyn.	Dyn.	Eise.	12	Holmes
Hudson O	7	2400	125	34x4½	optional	3½x5	Own	6	29.40	1½—Own	4.45	Own	Own	Spicer	Timken	Gemmer	Stewart	Kelsey	6	105	Exide	Delco	Delco	Delco	6	Hudson O
Huffman W	5	1895	120	32x4	Firestone	3½x4½	Cont.	6	25.35	.....	.....	B. and B.	Covert	.....	Salisbury	Ditweiler	Stewart	Firestone	12	90	Willard	Dyn.	Dyn.	Conn.	6	Huffman W
Hupmobile R-4	5	1550	112	32x4	Goodyear	3½x5½	Own	4	16.90	1—Strom.	4.87	Own	Own	Detroit	Own	Jacox	V. Sicklen	Kelsey	6	90	Willard	West.	West.	A-K	6	Hupmobile R-4
Jackson 6-38	5	1885	121	33x4	Goodyear	3½x4½	Cont.	6	25.35	1—Strom.	.....	B. and B.	Covert	Detroit	Salisbury	Own	Stewart	Jaxon	6	94	U. S. L.	A-L	A-L	Remy	6	Jackson
Jones 28	7	2250	126	34x4	Goodrich	3½x5½	Cont.	6	29.40	1¼—Ray.	4.50	B. and B.	G-L	Arvac	Stan-Par	C. A. S.	Stewart	Firestone	6	120	Prest.	A-L	A-L	A-L	6	Jones 28
Jordan F	7	2975	127	32x4½	Goodyear	3½x5½	Cont.	6	29.40	1¼—Strom.	4.08	Detroit	Detroit	Spicer	Timken	Gemmer	V. Sicklen	Firestone	6	118	Willard	Delco	Delco	Delco	6	Jordan F
Jordan M	5	2650	120	32x4	Goodyear	3½x4½	Cont.	6	25.35	1¼—Strom.	4.66	Detroit	Detroit	Spicer	Timken	Gemmer	V. Sicklen	Firestone	6	94	Willard	Delco	Delco	Delco	6	Jordan M
Kenworthy 6-55	5	3900	130	32x4½	optional	3½x5½	Cont.	6	29.40	—Strom.	4.10	B-Lipe	B-Lipe	Ther-H	Col.	Ross	Warner	.....	6	140	Exide	West.	West.	Bosch	6	Kenworthy 6-55
King H	7	2585	120	32x4½	optional	3x5	Own	8	28.80	1½—Ball	4.08	Detroit	Own	Ther-H	Col.	Jacox	V. Sicklen	Standard	6	120	Prest.	West.	West.	.....	6	King H
Kissell	7	3175	124	32x4½	Goodyear	3 7/8x5½	Own	6	26.75	1½—Strom.	4.25	Warner	Warner	Spicer	Own	Jacox	Stewart	Firestone	6	120	Willard	Remy	Remy	Remy	6	Kissell
Klinekar 6-55-J	5–7	2090	121	33x4	Goodyear	3½x4½	Cont.	6	25.35	1¼—Ray.	4.50	B. and B.	G-L	Flexite	Standard	Wohlrab	Stewart	Firestone	6	90	Prest.	Wagner	Wagner	Conn.	6	Klinekar 6-55-J
LaFayette	7	....	132	33x5	Firestone	3½x5½	Own	8	33.80	2—Own*	.....	Own	Own	Own	Own	Own	Waltham	Firestone	6	.....	Exide	Delco	Delco	Delco	6–8	LaFayette
Leach	5–7	4900	126½	32x4½	Goodyear	3½x5½	Cont.	6	29.40	—Ray.	.....	B-L	B-L	Spicer	Standard	Liberty	.....	.....	6	180	Prest.	Delco	Delco	Delco	6–8	Leach
Lexington S-20	5	2185	122	32x4	optional	3½x4½	Cont.	6	25.35	1¼—Ray.	4.66	B. and B.	Warner	Hardy	Own	C. A. S.	Stewart	Kelsey	6	100	Willard	G-D	G-D	Conn.	6	Lexington S-20
Liberty 10-C	5	1795	117	32x4	Goodyear	3½x5	Own	6	23.44	1—Strom.	4.66	B. and B.	Detroit	Spicer	Timken	Gemmer	Stewart	Firestone	6	90	Willard	Wagner	Wagner	Wagner	6	Liberty 10-C
Locomobile 48	7	8900	142	35x5	optional	4½x5½	Own	6	48.60	1¾—Own*	3.80	Own	Own	Own	Own	Own	Stewart	Firestone	6	140	Exide	West.	West.	Berl.	6	Locomobile 48
Lorraine	5	1425	114	32x4	Republic	3½x5	H-S	4	19.60	1—John.	4.75	B. and B.	G-L	Acme	Standard	Gemmer	Stewart	Stanweld	6	94	U. S. L.	West.	West.	West.	6	Lorraine
Maibohm B	5	1495	116	32x4	Fisk	3½x4¼	Falls	6	23.44	1—Till.	4.50	B. and B.	Muncie	Flexite	Peru	Bucyrus	Stewart	Stanweld	6	94	Willard	Bijur	Bijur	A-K	6	Maibohm B
Marmon 34	7	5000	136	32x4½	optional	3¾x5½	Own	6	33.75	1½—Strom.#	4.10	Own	Own	Spicer	Own	Own	V. Sicklen	Stanweld	6	162	Willard	Delco	Delco	Delco	6	Marmon 34
Marshall K	5	1295	118	32x3½	Firestone	3½x5	Lyco.	4	19.60	1—Zen.	.....	B. and B.	G-L	Spicer	Peru	Gemmer	Stewart	Firestone	6	160	Willard	Dyn.	Dyn.	Delco	6	Marshall K
Maxwell 25	5	1055	109	30x3½	.....	3⅜x4½	Own	4	21.03	1—.	.....	Own	Own	Own	Own	Own	Stewart	.....	12	80	Prest.	.....	.....	A-K	12	Maxwell 25
McFarland 127	7	5100	136	35x5	Goodrich	4½x6	T-McF	6	48.60	1½—Strom.	3.58	B. and B.	B-L	Spicer	Timken	Warner	Stewart	Firestone	6	120	Willard	West.	West.	Bos-W.	6	McFarland 127
Mercer Series 5	6	4950	132	32x4½	optional	3¾x6¾	Own	4	22.50	1½—Ball	3.87	Own	Own	Spicer	Own	Gemmer	Warner	Firestone	6	182	Willard	West.	West.	Eise.	6	Mercer Series 5
Meteor K R	4	5000	129	32x4½	optional	4x6	Duesen.	4	25.60	1½—Zen.	4.41	B. and B.	Own	.....	Standard	Gemmer	Warner	.....	6	.....	Willard	Bijur	Bijur	Simms	6	Meteor K R
Metz Master 6	5	1895	120	32x4	Goodrich	3½x5	Ruten.	6	23.44	1—Strom.	4.63	B. and B.	B-L	Hart	Timken	Own	Stewart	Firestone	6	110	Willard	West.	West.	Conn.	6	Metz Master 6
Mitchell F-40	5	1750	120	33x4	.....	3½x5	Own	6	25.35	1¼—Ray.	4.41	B. and B.	Own	Own	Own	Own	Stewart	Stanweld	6	94	Willard	Remy	Remy	Remy	6	Mitchell F-40
Monitor M. & O.	5	2475	121	33x4	Miller	3½x4½	Cont.	6	25.35	1—Strom.	.....	B. and B.	G-L	.....	Stanweld	C. A. S.	Stewart	Stanweld	6	110	Prest.	Dyn.	Dyn.	Conn.	6	Monitor M. & O.
Monroe S-9	5	1440	115	32x3½	Goodyear	3½x4½	Own	4	16.90	1⅜—Zen.	4.50	Own	Muncie	Universal	Own	C. A. S.	Stewart	Firestone	6	80	U. S. L.	A-L	A-L	Conn.	6	Monroe S-9
Moon 6-48	5	2285	122	32x4	Miller	3½x4½	Cont.	6	25.35	1¼—Ray.	.....	B. and B.	B-L	Spicer	Timken	Warner	Stewart	Firestone	6	110	Exide	Delco	Delco	Delco	6	Moon 6-48
Moon 6-68	7	2750	125	32x4½	Miller	3½x5½	Cont.	6	29.40	1¼—Ray.	4.45	B. and B.	B-L	Spicer	Timken	Warner	Stewart	Firestone	6	110	Exide	Delco	Delco	Delco	6	Moon 6-68
Moore 30	5	1095	108	30x3½	Firestone	3x5	Own	4	14.40	1—Mar.	.....	Detlaff.	G-L	U. P.	Peru	Ditweiler	Stewart	Firestone	6	80	Willard	A-L	A-L	Conn.	6	Moore 30
Murray	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Murray
Nash 681	5	1595	121	33x4	optional	3½x5½	Own	6	25.35	1¼—Mar.	4.50	B. and B.	Own	Own	Own	Gemmer	Stewart	Firestone	6	100	Willard	Wagner	Wagner	Wagner	6	Nash 681
Nash 682	7	1765	127	34x4½	optional	3½x5½	Own	6	25.35	1¼—Mar.	4.50	B. and B.	Own	Own	Own	Gemmer	Stewart	optional	6	100	Willard	Wagner	Wagner	Wagner	6	Nash 682

Engines—Ruten., Rutenber; Cont., Continental; Weid., Weidely; North., Northway; H-S., Herschell-Spillman; Lyco., Lycoming; D-Lyco., Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-McTeetor-McFarlan; #, Monson or Duesenberg; R. & V., Root & Van Dervoort. **Carburetor**—Strom., Stromberg; Zen., Zenith; Ray., Rayfield; John., Johnson; Mar., Marvel; Sund., Sunderman; Stew. Stewart; H-K., Holley-Kingston; Newc., Newcomb; Scheb., Schebler; Tillot., Tillotson; Johns., Johnston. Fuel feed vacuum except where otherwise indicated. *Pressure. #Gravity. **Generator and Motor**—A-L., Auto-Lite; West., Westinghouse; #, Westinghouse or Auto-Lite; W-L., Ward-Leonard; Dyn., Dyneto; N. E., North East; L-N., Leece-Neville; A-C., Allis-Chalmers; Split., Splitdorf; S-H., Simms-Huff; G. & D., Gray & Davis. **Ignition**—A-K., Atwater-Kent; Conn., Connecticut; Eise., Eisemann; West., Westinghouse; Will., Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W., Bosch-Westinghouse; Split., Splitdorf. **Gearset**—G-L., Grant-Lees; North., Northway; B-L., Brown-Lipe. **Rear Axle**—Col., Columbia; W-Weiss, Walker-Weiss; C-Timk., Cadillac-Timken; West-Mott, Weston-Mott. **Universals**—Hart., Hartford; Ther-H., Thermoid-Hardy; U. M. Co., Universal Machine Co. **Speedometer**—J-Man., Johns-Manville; V-Sicklen, Van Sicklen; A-C., Allis-Chalmers.

Motor Age Monthly Passenger Car Specification Tables

These prices apply to five and seven-passenger models only.

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. HP.	Carbureter Size and Make	Gear Ratio	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model
National Sextet BB	7	3500	130	32x4½	optional	3½x5½	Own	6	29.40	1½—Ray.	4.08	B. and B.	B-L	Arvac	Col.	Warner	Warner	Firestone	6	110	Prest.	West.	West.	Delco	6	National Sextet BB
Nelson D	5	1700	104	32x4	Goodyear	3½x4½	Own	4	15.63	1—Zen.	4.25	Own	Own	Own	Own	Stewart	Kelsey	12	72	Willard	U. S. L.	U. S. L.	Bosch	12	Nelson D
Noma 1-B	4	2900	128	32x4½	Goodyear	3½x4½	Cont.	6	25.35	1½—Zen.	4.45	B. and B.	Detroit	Spicer	Timken	Lavine	Stewart	Houk	6	104	Willard	Delco	Delco	Delco	6	Noma 1-B
Oakland 34-C	5	1235	115	32x4	Goodyear	2 1/8x4½	Own	6	18.99	1—Mar.	4.50	Own	Muncie	Mechanics	Buick	Jacox	Stewart	Jaxon	6	85	Prest.	Remy	Remy	Remy	6	Oakland 34-C
Ogren 6-60	6	3250	134	33x5	Goodyear	3½x5½	Conn.	6	33.75	1½—Opt.	.....	B-L	B-L	Arvac	Timken	Own	Warner	Firestone	6	120	Willard	West.	West.	Bosch	6	Ogren 6-60
Oldsmobile 37-A	5	1395	112	32x4	Goodyear	2 1/8x4½	Own	6	18.99	1½—John.	4.58	Own	Warner	Spicer	West. Mott	Jacox	Stewart	Jaxon	6	80	Willard	Remy	Remy	Remy	6	Oldsmobile 37-A
Oldsmobile 45-B	7	2045	120	33x4½	Goodyear	2½x4½	Own	8	26.45	1½—Ball.	4.91	Own	Warner	Spicer	West-Mott	Jacox	Stewart	Jaxon	6	.....	Willard	Delco	Delco	Delco	6	Oldsmobile 45-B
Olympian 45	5	1240	112	32x3½	Miller	3½x4½	Own	4	16.90	1½—Strom.	.....	B. and B.	Own	.....	Peru	Warner	Stewart	Perlman	6	.....	U. S. L.	A-L	A-L	Conn.	6	Olympian 45
Overland 4	5	945	100	30x3½	Fisk	3½x4	Own	4	18.23	1—Tillot. #	4.50	B. and B.	Own	Own	Own	Own	Stewart	Stanweld	6	80	U. S. L.	A-L	A-L	Conn.	6	Overland 4
Owen-Magnetic W-42	7	7000	142	35x5	optional	4x5½	Weid.	6	38.40	—Zen.	.....	Own	Own	Spicer	Amer.	Own	Warner	Firestone	24	.....	Willard	Own	Own	Bosch	28	Owen-Magnetic W-42
Packard Twin Six	7	....	136	35x5	optional	3x5	Own	12	43.20	—Own*	4.36	Own	Own	Spicer	Own	Own	Waltham	Firestone	6	120	Willard	Bijur	Bijur	Delco	7	Packard Twin Six
Paige 6-42	5	1770	119	32x4	optional	3½x5	Own	6	23.44	1—Strom.	4.50	B. and B.	Own	Detroit	Salisbury	Jacox	Stewart	Kelsey	6	108	Willard	G. & D.	G. & D.	A-K	6	Paige 6-42
Paige 6-55	7	2400	127	33x4½	optional	3½x5½	Cont.	6	29.40	1½—Ray.	4.33	B. and B.	Own	Detroit	Salisbury	Jacox	Stewart	Kelsey	6	108	Willard	G. & D.	G. & D.	A-K	6	Paige 6-55
Paragon	.....	.....	122	.....	.....	3⅞x5⅛	.....	4	22.50	.....	4.25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Paragon
Parenti	5	1685	123	32x4	.....	3x4½	Cameron	6	21.60	—Zen.	.....	B. and B.	Cameron	.....	Own	Own	Stewart	Jaxon	6-8	84	U. S. L.	Bijur	Bijur	Conn.	.....	Parenti
Paterson 6-47	7	1725	120	33x4	optional	3½x4½	Cont.	6	25.35	1½—Strom.	4.50	B. and B.	Durston	Hartford	Stan-Par.	Jacox	Stewart	Jaxon	6	80	Willard	Delco	Delco	Delco	6	Paterson 6-47
Peerless Series 6	7	3050	125	34x4	Goodyear	3½x5	Own	8	33.80	1½—Ball.	4.54	Own	Own	.....	Own	Gemmer	V. Sicklen	Firestone	6	125	Willard	A-L	A-L	A-K	6	Peerless Series 6
Phianna R	5	9500	125	32x4½	U. S.	3 3/8x6	Own	4	24.70	1½—Strom.	.....	Own	Own	Own	Amer.	Own	Warner	Firestone	6	.....	Willard	W-L	W-L	Bosch	6	Phianna R
Piedmont 4-30	5	1395	116	32x3½	Firestone	3½x5	Lyc.	4	19.60	1—Carter	4.45	B. and B.	G-L	Hartford	Peru	Ditweiler	Stewart	Firestone	6	90	Willard	Delco	Dyn.	Delco	6	Piedmont 4-30
Piedmont 6-49	5	1865	122	32x4	Firestone	3½x4½	Cont.	6	25.35	1—Strom.	4.45	B. and B.	G-L	Hartford	Timken	Warner	Stewart	Firestone	6	90	Willard	Remy	Remy	Remy	6	Piedmont 6-40
Pierce-Arrow 38	7	7250	134	34x4½	Goodrich	4x5½	Own	6	38.40	—Own	3.78	Own	Own	Own	Own	Own	Waltham	Goodrich	6-8	135	.....	West.	West.	Delco	6	Pierce-Arrow 38
Pierce-Arrow 48	7	7750	142	35x5	Goodrich	4½x5½	Own	6	48.60	—Own	3.53	Own	Own	Own	Own	Own	Waltham	Goodrich	6-8	135	.....	West.	West.	Delco	6	Pierce-Arrow 48
Pilot 6-45	5	1650	120	32x4	Miller	3½x5	Teetor	6	23.44	1—Tillot.	4.90	B. and B.	Muncie	Hart	Spacke	Ditweiler	Stewart	Standard	6	100	Prest.	Delco	Delco	Delco	6	Pilot 6-45
Porter 46	7	9400	142	35x5	U. S.	4.6x6¾	Own	4	34.18	2½—Zen.	3.00	M. and E.	Own	.....	Own	Own	Stewart	Firestone	12	118	Prest.	West.	West.	Berl.	12	Porter 46
Premier 6-D	7	4300	126½	32x4½	Firestone	3½x5½	Own	6	27.34	1½—John.	4.50	B. and B.	Own	Peters	Stan-Par.	Warner	Own	Firestone	6	120	Willard	Delco	Delco	Delco	6	Premier 6-D
Reo T-6	5	1750	120	33x4	U. S.	3 3/8x5	Own	6	24.30	1½—Ray.	4.66	Own	Own	Own	Own	Own	Stewart	Firestone	6	115	Willard	N. E.	N. E.	N. E.	6	Reo T-6
ReVere C	7	4250	131	32x4½	optional	4½x6	Monsen	4	30.63	1¾—Strom.	3.44	B-L	B-L	Spicer	Standard	Gemmer	Stewart	Houk	6	120	Willard	West.	West.	Bosch	6	ReVere C
Roamer C-6-54	7	3075	128	32x4½	Goodyear	3½x5½	Cont.	6	29.40	1½—Strom.	.....	B. and B.	G-L	Ther-H	Stan-Par.	Jacox	Warner	Stanweld	6	90	Col.	Bijur	Bijur	Bosch	6	Roamer C-6-54
R & V Knight J	7	3150	127	32x4½	optional	3½x4½	Own	6	29.40	1½—Strom	4.90	B. and B.	B-L	Spicer	Timken	Jacox	Stewart	Firestone	6	117	Willard	Wagner	Wagner	Wagner	6	R & V Knight J
R & V Knight R	5	2150	115	32x4	optional	3½x5	Own	4	22.50	1½—Strom	4.75	B. and B.	B-L	Spicer	Salisbury	Jacox	Stewart	Firestone	6	117	Willard	Wagner	Wagner	Wagner	6	R & V Knight R
Saxon	5	1785	112	32x4	.....	3½x5	Own	4	18.23	1½—Strom.	4.75	Own	Own	Own	Own	Own	Stewart	Firestone	6	80	Prest.	Wagner	Wagner	Wagner	6	Saxon
Sayers Six	5	1895	118	33x4	Goodyear	3½x4½	Cont.	6	25.35	1—Zen.	.....	B. and B.	G-L	Arvac	Stan-Par.	Warner	Stewart	Firestone	6	80	Willard	Delco	Delco	Delco	6	Sayers Six
Scripps-Booth B-39	5	1425	115	32x4	Goodyear	2 1/16x4½	North.	6	18.99	1—Mar.	4.50	North.	Warner	Peters	West-Mott	Jacox	Stewart	Kelsey	6	85	Prest.	Remy	Remy	Remy	6	Scripps-Booth B-39
Seneca L	5	1185	108	30x3½	Miller	3½x4½	Le Roi	4	15.63	1—Scheb.	4.50	B. and B.	Warner	.....	Peru	Ditweiler	Stewart	Jackson	6	88	Prest.	A-C	A-C	Conn.	6	Seneca L
Severin	5	2400	122½	32x4½	.....	3½x5½	Cont.	6	29.40	—Strom.	4.50	B. and B.	Muncie	Peters	Salisbury	Lavine	.....	.....	6	.....	Camp.	Wagner	Wagner	Wagner	6	Severin
S. G. V.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	S. G. V.
Shaw	7	5000	136	33x5	Firestone	4½x6	Roch.	4	28.90	—Strom.	.....	B-L	B-L	.....	Timken	Jacox	Warner	.....	.....	.....	.....	West.	West.	Bosch	.....	Shaw
Singer 20	7	5800	108	33x5	Goodyear	2¾x5	Weid.	12	39.68	1½—Strom.	3.77	Covert	Covert	Spicer	Timken	Ross	Stewart	Own	6	162	Willard	West.	West.	Phil.	6	Singer 20
Skelton	5	1245	112	32x3½	optional	3½x5	Lycoming	4	19.60	1—Carter	4.25	B. and B.	Muncie	Universal	Peru	C. A. S.	Stewart	Stanweld	6	85	Prest.	West.	West.	Conn.	6	Skelton
Spacke S-20	2	295	90	28x3	U. S.	3½x3.67	Own	2	9.80	1—Carter #	5.09	Own	Own	.....	....	Own	Own	.....	.....	.....	.....	.....	.....	A-K	.....	Spacke S-20
Standard 8-I	7	3400	127	34x4½	optional	3½x5	Own	8	33.80	1¼—Zen.	4.45	B. and B.	G-L	Arvac	Timken	Gemmer	Stewart	Firestone	6	160	Willard	West.	West.	Opt.	6	Standard 8-I
Stanwood	.....	....	118	.....	.....	.....	Cont.	6	.....	—Strom.	.....	B. and B.	G-L	.....	Stan-Par.	Gemmer	.....	.....	.....	.....	.....	West.	West.	A-K	.....	Stanwood
Stearns SKL-4	5	2450	125	34x4½	Goodrich	3⅛x5⅝	Own	4	22.50	1¼—Scheb.	4.50	Own	Own	Spicer	Own	Own	V. Sicklen	Firestone	12	65	Willard	West.	West.	A-K	12	Stearns SKL-4
Stephens 80	6	2050	122	33x4½	Fisk	3½x4½	R & V	6	25.35	1½—Tillot.	4.75	B. and B.	Mechanics	Mechanics	Stan-Par	C. A. S.	Stewart	Stanweld	6-8	116	U. S. L.	A-L	A-L	A-L	6	Stephens 80
Stevens-Duryea	7	7000	138	35x5	optional	4 1/16x5½	Own	6	47.25	.....	.....	Own	Own	Own	Own	Own	Waltham	Firestone	6	.....	.....	West.	West.	Berl.	6	Stevens-Duryea
Studebaker E-J	5	1435	112	32x4	.....	3½x4½	Own	6	23.44	—Strom.	4.55	Own	Own	.....	Own	Own	V. Sicklen	Kelsey	6	80	Willard	Wagner	Wagner	Remy	6	Studebaker E-J
Studebaker E-G	7	2250	126	33x4½	Goodyear	3½x5	Own	6	36.04	1½—Ball.	3.70	Own	Own	Spicer	Own	Own	V. Sicklen	Kelsey	6	80	Willard	Wagner	Wagner	Wagner	6	Studebaker E-G

Engines—Ruten., Rutenber; Cont., Continental; Weid., Weidely; North., Northway; H-S., Herschell-Spillman; Lyco., Lycoming; D-Lyco., Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-McTeetor-McFarlan; #, Monson or Duesenberg; R. & V., Root & Van Dervoort. **Carburetor**—Strom., Stromberg; Zen., Zenith; Ray., Rayfield; John., Johnson; Mar., Marvel; Sund., Sunderman; Stew. Stewart; H-K., Holley-Kingston; Newc., Newcomb; Scheb., Schebler; Tillot., Tillotson; Johns., Johnston. Fuel feed vacuum except where otherwise indicated. *Pressure. #Gravity. **Generator and Motor**—A-L., Auto-Lite; West., Westinghouse; #, Westinghouse or Auto-Lite; W-L., Ward-Leonard; Dyn., Dyneto; N. E., North East; L-N., Leece-Neville; A-C., Allis-Chalmers; Split., Splitdorf; S-H., Simms-Huff; G. & D., Gray & Davis. **Ignition**—A-K., Atwater-Kent; Conn., Connecticut; Eise., Eisemann; West., Westinghouse; Will., Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W., Bosch-Westinghouse; Split., Splitdorf. **Gearset**—G-L., Grant-Lees; North., Northway; B-L., Brown-Lipe. **Rear Axle**—Col. Columbia; W-Weiss Walker-Weiss; C-Timk. Cadillac-Timken; West-Mott Weston-Mott. **Universals**—Hart. Hartford; Ther-H. Thermoid-Hardy; U. M. Co. Universal Machine C **Speedometer**—J-Man. Johns-Manville; V-Sicklen Van Sicklen; A-C. Allis-Chalmers.

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. HP.	Carburetor Size and Make	Gear Ratio	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages
Studebaker E-H	5	1785	119	32x4	.....	3½x5	Own	6	29.40	1¼—Strom.	4.33	Own	Own	Spicer	Own	Own	V. Sicklen	Kelsey	6	80	Willard	Wagner	Wagner	Wagner	6
Stutz H	6	3350	130	32x4½	optional	3½x6	Own	4	30.63	1½—Strom.	3.50	Own	Own	Own	Own	Gemmer	Warner	.....	6	130	Willard	Remy	Remy	Delco	6
Templar A-445	5	2685	118	32x4	optional	3½x5½	Own	4	18.23	1¼—Strom.*	4.40	B. and B.	Detroit	Hardy	C. A. S.	C. A. S.	Warner	Firestone	6	100	.....	Bijur	Bijur	Simms	6
Texan	5	1395	115	33x4	Southland	3½x5	Lyc.	4	19.60	—Car.	.....	B. and B.	G-L	U. P.	Peru	C. A. S.	Stewart	Firestone	6	80	Prest.	Bijur	Bijur	Conn.	6
Tulsa E	5	1445	117½	33x4	Firestone	5x3¾	H-S	4	19.60	1¼—Zen.	4.50	B. and B.	Muncie	.....	Salisbury	C. A. S.	Stanweld	Stanweld	6	80	Exide	Dyn.	Dyn.	Conn.	6
Velie 48	5	1785	115	32x4	Goodyear	3½x4½	Cont.	6	25.35	1¼—Ray.	4.66	B. and B.	Durston	Arvac	Timken	Gemmer	V. Sicklen	Firestone	6	120	Willard	Bijur	Bijur	Bijur	6
Velie 34	5	1485	112	32x3½	optional	3½x4½	Falls	6	21.44	—Ray.	4.60	B. and B.	Durston	Col.	Timken	Gemmer	V. Sicklen	Firestone	6	100	Willard	West.	West.	A-K	6
Wasp	4	5000	132	33x5	Firestone	4½x5½	Wis.	4	36.10	1¼—Strom.	3.10	.....	Covert	Spicer	Timken	Gemmer	Stewart	Firestone	6	145	Exide	West.	West.	Bosch	6
Westcott C-38	5	2490	118	33x4	Firestone	3½x4½	Cont.	6	25.35	1¼—Ray.	5.09	B. and B.	Warner	Peters	Timken	Gemmer	V. Sicklen	Firestone	6	117	Willard	Delco	Delco	Delco	6
Westcott C-48	7	2990	125	32x4½	Firestone	3½x5½	Cont.	6	29.40	1¼—Ray.	4.45	B. and B.	B-L	Peters	Timken	Gemmer	V. Sicklen	Firestone	6	117	Willard	Delco	Delco	Delco	6
Willys-Knight 20	5	1975	118	33x4	Fisk	3½x4½	Own	4	21.03	1—Tillot.*	.....	B. and B.	Own	Ther-H.	Own	Own	Stewart	Stanweld	6	170	U. S. L.	A-L	A-L	Conn.	6
Winther 61	5	....	120	33x4	optional	3½x5	H-S	6	25.35	1¼—Strom.	4.50	Warner	Warner	Peters	Spacke	Lavine	Stewart	Firestone	6	127	Willard	West.	West.	West.	6
Winton 25	7	4250	132	35x5	optional	3½x5½	Own	3	33.75	1½—Strom.	4.90	.....	.....	.....	.....	.....	Warner	Firestone	6	120	Willard	Bijur	Bijur	Bosch	6

STEAM CARS

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. HP.	Carburetor Size and Make	Gear Ratio	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages
Stanley 735-B	7	4275	130	4x4½	Goodyear	4-5	Own	2	.....	none	none	none	none	.....	Own	Warner	V. Sicklen	Firestone	6	116	Willard	Remy	None	None	6

Stanley 735-B | Stanley 735-B

Engines—Ruten., Rutenber; Cont., Continental; Weid., Weidely; North., Northway; H-S., Herschell-Spillman; Lyco., Lycoming; D-Lyco., Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-McTeetor-McFarlan; #, Monson or Duesenberg; R. & V., Root & Van Dervoort. **Carburetor**—Strom., Stromberg; Zen., Zenith; Ray., Rayfield; John., Johnson; Mar., Marvel; Sund., Sunderman; Stew. Stewart; H-K., Holley-Kingston; Newc., Newcomb; Scheb., Schebler; Tillot., Tillotson; Johns., Johaston. Fuel feed vacuumexcept where otherwise indicated. *Pressure. #Gravity. **Generator and Motor**—A-L., Auto-Lite; West., Westinghouse; #, Westinghouse or Auto-Lite; W-L., Ward-Leonard; Dyn., Dyneto; N. E., North East; L-N., Lecce-Neville; A-C., Allis-Chalmers; Split., Splitdorf; S-H., Simms-Huff; G. & D., Gray & Davis. **Ignition**—A-K., Atwater-Kent; Conn., Connecticut; Eise., Eisemann; West., Westinghouse; Will., Willard; N. E., North East; K-Remy, Kingston-Remy; Ber., Bering; Bosch-W., Bosch-Westinghouse; Split., Splitdorf. **Gearset**—G-L., Grant-Lees; North., Northway; B-L., Brown-Lipe. **Rear Axle**—Col., Columbia; W-Weiss, Walker-Weise; C-Timk., Cadillac-Timken; West-Mott, Weston-Mott. **Universals**—Hart., Hartford; Ther-H., Thermoid-Hardy; U. M. Co., Universal Machine Co. **Speedometer**—J-Man., Johns-Manville; V-Sicklen, Van Sicklen; A-C., Allis-Chalmers.

TRUCK SALESMANAGERS MEET

Chicago, March 29—Plans for a more efficient merchandising of motor trucks were discussed by the National Association of Motor Truck Sales Managers at its annual meeting here. One of the subjects of interested discussion was the truck show, on which subject a paper was read by Charles S. Pike of the Paige-Detroit Motor Car Co. The result was that a committee is to be named by Pres. J. E. Tracy to confer with a committee of the N. A. C. C. to discuss plans for more satisfactory shows than were held this winter. Many favor a show in some such central location as Madison Square Garden, held at the same time as the passenger car show.

Better selling and business methods were recommended by several speakers. It is recognized that cost systems must be introduced and price cutting eliminated before the dealers in trucks can attain business stability.

At a luncheon Saturday, E. E. Peake of Kansas City told how to build and maintain a successful dealer association and he urged that the truck and passenger car dealers remain in one parent organization during these formative stages of the business. Mr. Peake said the trouble is there are more trucks than buyers and that sales methods need improvement. Arthur H. Kroh made a strong appeal for support from the truck men for a campaign to improve farm life, bring about diversified farming and greater production.

A session of the Motor Truck Manufacturers' Association was held yesterday at which plans for future work were explained to the members by David Thomas, who became secretary of the association about a month ago. The next meeting of the Truck Manufacturers' Association will be held April 3, probably at the Congress.

KEEPING THE TRACTOR FIT

(Continued from page 37)

tor parts. It need not be a wide assortment, if well selected, to include the parts most commonly needed.

Some factories make recommendations as to just what parts the farmer ought to have and see to it that the dealer supplies the farmer accordingly. Usually the assortment costs about $70. Just as soon as one of the parts are used, the dealer is notified and sends out another, so as to keep the assortment always intact.

Complete overhauls for tractors are just coming into fashion. The tractor, generally speaking, has not been with us long enough to warrant complete overhauls as we look upon a car or truck overhaul. But the time is here when the dealer will perhaps have to get the tractor into his shop during the months when tractors are idle and tear it down and rebuild completely. The motor car dealer uses the winter months for putting in trim his customers' cars for the summer season and similarly the tractor dealer might use the winter for tractor overhauls.

From the Four Winds

Glimpses at the World of Motordom

Coming Motor Events

AUTOMOBILE SHOWS

Goldsboro, N. C.	Goldsboro Automotive Trade Ass'n	March 31 to April 3
Gloversville, N. Y.	Automobile Show	April 5 to 10
Albany, N. Y.	Automobile Show	April 6 to 10
Fort Worth, Tex.	Automobile Show	April 12 to 17
Kingston, Ont.	First Annual Show	April 27 to May 1
Macon, Ga.	Macon Automobile Dealers' Ass'n	May 6 to 8

RACES

Indianapolis Speedway	500-mile Race	May 31
Uniontown, Pa.	Speedway Race	June 12
Tacoma, Wash.	Speedway Race	July 5
Cincinnati, O.	Speedway Race	Sept. 6
Uniontown, Pa.	Speedway Race	Sept. 6

TOURS

Omaha, Neb.	Truck Reliability Run	June 1
Lake Huron Tour		July 4
New York-San Francisco	Glidden Tour	September

TALES OF WAYSIDE REPAIRS

(Concluded from page 40)

hour and having smoked every cigar I had, I finally tore a signboard down and constructed a scaffold around the wheel. One member was tied across the rear of the springs, and enough was allowed to protrude so that a strip could be placed alongside the wheel, fastened to the outstanding end of the piece tied to the spring. The other end of the strip alongside the wheel was wedged under the running board and tied by a piece of wire to one of the bender bolts. Two small blocks were nailed over this wheel strip so that they formed an imitation hub cap. Then we smeared the whole thing with grease and drove to town eleven miles away."

"Kindergarten stuff," remarked Joe Bush, in a tone bordering on disgust, but intimating in a conceitful way that he had something better. "We anticipated trouble and consequently when it came, we laughed at it. We made a temporary axle, long enough to protrude through a temporary hub cap about 6 in. This gave ample room to use either a rope or a cable for a winch to pull the car forward or backward."

Joe paused, his throat was dry.

After drinking a glass of water, he recommenced, "believe me, boys, it was fortunate we made this axle for when we took our trip that year, we sure found use for it. We came across a mudhole that made me think of the story about the man who was almost submerged in mud. His hat was visible and part of his head. When aid was offered him, he refused saying that the horse he was seated on was pretty reliable and would probably get through.

"The same with our car. It was a pretty reliable old boat and probably would have pulled if given time. Our time was short though so we thought we'd help it out. We wound a line around the extension axle, made one end fast to a telegraph pole ahead, and held the other end. Then as the clutch was let in the wheel took hold and wound itself out. The whole operation took about five minutes."

The evening was just about over when Walton remembered of a time when he had repaired a radiator with a handful of cornmeal and a piece of copper wire. Whereupon the meeting was adjourned in riot fashion.

Reward Thief Apprehension—The first $100 reward ever paid by the Inland Automobile Association, Spokane, Wash., for information leading to the arrest and conviction of persons stealing cars owned by members of the association, was paid to an automobile salesman, M. H. Mitchell, of the John Doran company.

Canada Imports Tractors—The number of tractors shipped into Canada from the United States during the first eight months of 1919 exceeded by nearly 1000 the total number of automobiles and motor trucks shipped. 8047 tractors were imported by Canada from the States during that period. About 15,000 tractors are now in use in Canada.

Canada Doubles Car Output—During the past year Canada more than doubled her output of automobiles and 20,104 cars, valued at $11,868,762, were exported. The automobile business is one of the fastest-growing in the whole Dominion, and by mid-summer it is estimated that nearly $15,000,000 worth of new factories and new equipment for increasing the output will be in operation. In addition to the export demand there is an enormous home demand to take care of. Just how great this is may be gathered from the fact that the returns for the Province of Ontario show that the number of cars in actual use has doubled every two years for some time past. The farmers are heavy buyers of automobiles and in many sections of the country 80 per cent of them drive their own cars.

Shipping Stock by Airplane

The first live stock shipment ever made to Chicago by airplane was from Omaha with a young porker as the distinguished passenger